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PTERIDOPHYTA OF PERU

Part IV

17. Dryopteridaceae

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PTERIDOPHYTA OF PERU

Part IV

17. Dryopteridaceae

Introduction

This fourth part of the "Pteridophyta of Peru" is devoted exclusively to the family Dryopteridaceae. The general style, typography, form of citations, and so forth follow the previously published parts I and II. These matters are adequately dealt with in part I (Fieldiana: Botany, n.s. No. 20, 1989), and it is not necessary to repeat them here.

Stigmatopteris, *Olfersia*, and *Polybotrya* have been contributed by Robbin C. Moran, and *Elaphoglossum* and *Peltapteris* have been contributed by John T. Mickel. Other genera have been a joint effort of Rolla M. Tryon and Robert G. Stolze, each critically reviewing the treatments prepared by the other.

The Dryopteridaceae are the largest family of Pteridophyta in Peru, with 26 genera and about 200 species. Many of the genera are taxonomically difficult because of considerable variation and the lack of recent critical work on the Andean elements that would provide guidance. Among these may be mentioned *Ctenitis*, *Megalastrum*, *Tectaria*, *Polystichum*, *Diplazium*, and *Elaphoglossum*. In these genera there is clearly a maximum of variation in the Andes from Bolivia north to Colombia, and also extensive intergradation between many of the variations of a species. The taxonomy is often less complicated to the east and north, especially in Mexico and Central America. Accordingly, a number of commonly recognized species are placed as synonyms for Peru or they are maintained with some doubt. Although the treatments for Peru are based on all materials from South America, or from tropical America, there is need for monographic study of many genera, so that the species characters are better known and

intergradation and its geographic basis are more fully understood.

Type collections from Peru are mentioned in the nomenclature but are not repeated in the specimen citations. They are, however, included in the Peru range and ecology. The nomenclature of the genera and species is not intended to be complete. It includes all names based on Peru material and other names that are considered useful to mention.

C. V. Morton (Amer. Fern J. 62: 57–64, 1972) has argued that the Cryptogamae Vasculares Quintensenses of Sodiro was published over a period of years, most of it in the *Anales Univ. Quito*, 1890–1895, and a small part in the *Anales Univ. Central Rep. Ecuador*, 1897. He proposed that the book was not published until 1897. This conclusion may be correct, although Luis Mille, who was certainly in a position to know, indicated (Nov. Rec. Crypt. Vasc. Ecuador, page 1 and page 5, 1927) that the book was published in 1893. We accept that date and consequently only one of the names cited for the Pteridophyta was published earlier in the *Anales*: *Acrostichum setigerum* Sodiro, 1890 = *Elaphoglossum setigerum* (Sodiro) Diels.

Abbreviations of periodicals generally follow the system of *Botanico-Periodicum-Huntianum* (1968), while those of books and authors generally follow the system of Taxonomic Literature (TL-2, 1976 *et seq.*) The acronyms for herbaria follow Index Herbariorum and are also provided below.

Acknowledgments

The authors are extremely grateful to Dr. John T. Mickel (*Elaphoglossum*, *Peltapteris*) and Dr.

Robbin C. Moran (*Olfersia*, *Polybotrya*, *Stigmatopteris*) for contributing treatments of genera that are their particular specialties. Their having lent their expertise to this Flora has provided our best understanding of the species of these genera in Peru.

We would like to extend special thanks to Dr. Abundio Sagástegui (HUT) and Blanca León (USM) for their invaluable assistance in preparing loans and arranging for packing and shipment of specimens from those two important Peruvian herbaria. The original drawings were contributed by Field Museum scientific illustrators Zorica Dabich and Clara L. Richardson, and by volunteer illustrator Julia A. Liesse. Their careful study, painstaking efforts, cooperation, and patience have produced the splendid drawings which add so much to the descriptions. We are also grateful to Dr. David S. Barrington (*Polystichum*) and Dr. Alan R. Smith (*Cyclodium*) for their critical suggestions on treatments of these two genera. Thanks are also extended to reviewers of the manuscript for their valuable comments.

We are also grateful to the officers of the following institutions for granting loans of their material or allowing us to examine specimens in their herbaria: Herbarium Amazonense, Universidad Nacional de la Amazonia Peruana, Iquitos, Peru (AMAZ); Herbarium Jutlandicum, Aarhus Universitet, Denmark (AAU); Botanischer Garten und Botanisches Museum, Berlin-Dahlem, Berlin (B); British Museum (Natural History), London (BM); Herbario Nacional Colombiano, Museo de Historia Natural, Bogotá, Colombia (COL); Royal Botanic Garden, Edinburgh (E); Field Museum of Natural History, Chicago (F); Harvard University Herbaria, Cambridge, Mass.—most Gray Herbarium (GH), some Arnold Arboretum (A); Herbarium Truxillense, Universidad Nacional de Trujillo, Trujillo, Peru (HUT); Royal Botanic Gardens, Kew, England (K); Herbario Nacional de Bolivia, Universidad Mayor de San Andres, La Paz, Bolivia (LPB); Missouri Botanical Garden, St. Louis (MO); New York Botanical Garden, New York (NY); Muséum National d'Histoire Naturelle, Paris (P); Herbario del Instituto de Ciencias Naturales, Universidad Central, Quito, Ecuador (Q); Instituto de Ciencias, Pontificia Universidad Católica del Ec-

uador, Quito, Ecuador (QCA); University of California, Berkeley (UC); Instituto Botánico, Caracas, Venezuela (VEN); United States National Herbarium, Smithsonian Institution, Washington, D.C. (US); Herbario San Marcos, Universidad Nacional Mayor de San Marcos, Lima, Peru (USM); and Naturhistorisches Museum, Vienna (W).

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Family 17. DRYOPTERIDACEAE

Dryopteridaceae Herter, Rev. Sudam. Bot. 9: 15. 1949; description from Baker in Mart., Fl. brasil. 1(2): 458, Polypodiaceae, Tribe Aspidaceae. TYPE: *Dryopteris* Adans.

Stem stout to slender, often branched, erect, rarely arborescent, decumbent to long-creeping or scandent, usually indurated, bearing scales. **Leaves** ca. 1 cm to 3 m long, circinate in vernation, monomorphic to dimorphic, entire to usually pinnate, rarely to flabellate, glabrous, pubescent, or scaly abaxially. **Petiole** lacking stipules, not articulate to the stem. **Veins** usually free, to anastomosing. **Sori** abaxial, round to very elongate, at the tip of a vein, or along it, indusiate or exindusiate, or the sporangia generally distributed over the surface of the fertile segments; sometimes paraphysate, usually not. **Sporangia** with a 2- or 3-rowed stalk and a vertical or nearly vertical annulus which is interrupted by the stalk.

The Dryopteridaceae are a family of perhaps 1,000 species and over 50 genera. There are 26 genera in Peru. It is characterized by monolet spores and a chromosome number based on $n = 40$ or 41 . The groups of genera are sometimes considered as subfamilies or families. Tryon and Tryon (1982) treated the Peruvian genera as in the following synopsis.

Key to Tribes of Dryopteridaceae in Peru

- a. Sporangia in sori, or sporangia acrostichoid and then the fertile and sterile leaves very strongly dimorphic, the fertile with much reduced green tissue and soon withering after the spores are shed b

- b. Petiole continuous c
 - c. Three vascular bundles, or more, near the base of the petiole Tribe Dryopterideae, genera I–XV
 - c. Two vascular bundles near the base of the petiole Tribe Phymatiae, genera XVI–XX
- b. Petiole jointed Tribe Oleandreae, genus XXI
- a. Sporangia acrostichoid and the fertile and sterile leaves more or less dimorphic, the fertile with green tissue and more or less persistent Tribe Bolbitideae, genera XXII–XXVI

The key to genera has been simplified, as much as possible, by including in a genus only the characters of species known from Peru or those likely to occur there. For example, the species of *Woodisia* with an articulate petiole are only far north of Peru and so the genus is keyed out as having a continuous petiole. In addition, genera are sometimes keyed out more than once to avoid long headings. Especially in species with decompound leaves, the costa (an axis bearing adnate or joined

segments) may have a different configuration on the adaxial (upper) side from that of the pinna-rachis.

Reference

TRYON, R. M., AND A. F. TRYON. 1982. Dryopteridaceae, pp. 454–627, in *Ferns and allied plants*, Springer-Verlag, New York.

Key to Genera of Dryopteridaceae

- a. Sporangia borne in well-defined sori, sometimes along the veins b
 - b. Indusium scalelike and attached at the base and arching over the sorus, or attached around the base of the receptacle, or elongate and attached at the center or on one side c
 - c. Indusium scalelike and attached at the base and arching over the sorus, or attached around the base of the receptacle d
 - d. Indusium scalelike and attached at the base and arching over the sorus XIX. *Cystopteris*
 - d. Indusium attached around the base of the receptacle XX. *Woodisia*
 - c. Indusium elongate, attached at the center or usually along one side e
 - e. Lamina 2-pinnate, the pinnules dimidiate, 3 or more vascular bundles near the base of the petiole X. *Didymochlaena*
 - e. Lamina entire to 5-pinnate, if 2-pinnate then the pinnules nearly equilateral; 2 vascular bundles near the base of the petiole f
 - f. Veins free, except as the tips are connected by a marginal strand, or veins copiously anastomosing and the lamina entire to pinnatisect, at least beyond the basal pinnae ... g
 - g. Sori often on both sides of a vein (especially on the basal veins of a vein-system) and then each sorus and indusium separate distally; lobes and ultimate segments (when present) entire, crenulate, or slightly and obtusely dentate; lamina entire to 3-pinnate-pinnatifid XVI. *Diplazium*
 - g. Sori single on a vein, sometimes partly on the other side and then the sorus and indusium continuous distally; ultimate segments linear or strongly and sharply dentate; lamina 2-pinnate to 5-pinnate XVII. *Athyrium*
 - f. Veins freely anastomosing toward the margin; lamina fully 1-pinnate XVIII. *Hemidictyum*
 - b. Indusium peltate or with a sinus and nearly orbicular to reniform, or indusium fugacious, nearly obsolete, or truly absent h
 - h. Petiole articulate (jointed) or pinnae articulate to the rachis i
 - i. Pinnae articulate, entire, with a large, basal, basiscopic auricle that overlies the rachis ... V. *Cyclopetis*
 - i. Petiole articulate; lamina entire XXI. *Oleandra*

- h. Petiole continuous (not articulate); pinnae (when present) continuous with the rachis j
- j. Adaxial side of the costa raised (axes of lower order, e.g., pinna-rachis or rachis, may be sulcate adaxially) k
- k. Veins anastomosing, or if free then the lamina pinnatifid (2-pinnatifid to 3-pinnatifid) IV. **Tectaria**
- k. Veins free and the lamina fully pinnate l
- l. Adaxial side of the pinna-rachis raised, or if sulcate then the groove not open to admit the groove of the rachis m
- m. Stem decumbent to erect; leaves caespitose; scales of the costae and rachis ample to abundant n
- n. Trichomes on the adaxial side of the axes reddish brown, with 2–4 cells, less than 0.4 mm long, catenate and usually with a blunt tip when dry; vein tips slender; basal basiscopic vein of distal pinnules arising from the costule (or very close to its juncture with the costa) I. **Ctenitis**
- n. Trichomes on the adaxial side of the axes whitish, usually with more than 4 cells, 0.5 mm or more long, terete or flat and with a pointed tip when dry; vein tips clavate; basal basiscopic vein of the distal pinnules definitely arising from the costa II. **Megalastrum**
- m. Stem long-creeping, bearing leaves at intervals; scales of the costae and rachis few or none III. **Triplophyllum**
- l. Adaxial side of the pinna-rachis sulcate, the groove continuous with that of the rachis o
- o. Adaxial side of the rachis with a central ridge and a glabrous groove on each side VI. **Rumohra**
- o. Adaxial side of the rachis with lateral ridges on each side of a pubescent groove VII. **Lastreopsis**
- j. Adaxial side of the costa sulcate or nearly flat (there may be a ridge on each side of the groove) p
- p. Sterile and fertile leaves strongly dimorphic; each meristele of the stem surrounded by a dark sclerenchymatous sheath; indusium absent XV. **Polybotrya**
- p. Sterile and fertile leaves monomorphic or nearly so; each meristele not enclosed by a dark sclerenchymatous sheath; indusium often present q
- q. Lamina tissue usually pellucid-punctate (the “dots” especially visible with transmitted light), or if the tissue (rarely) lacking visible “dots” then the lamina 1-pinnate, the indusium absent, and the pinna-base better developed on the basiscopic side XI. **Stigmatopteris**
- q. Lamina tissue uniform, not pellucid-punctate, the lamina entire to 5-pinnate, if 1-pinnate the indusium present, or if absent then the pinna-base better developed on the acroscopic side r
- r. Veins mostly to wholly free; lamina pinnatifid (2-pinnatifid to 3-pinnatifid) and indusium present, or veins anastomosing and orbicular indusia often present and these with a sinus IV. **Tectaria**
- r. Veins mostly or wholly free and the lamina pinnate, or veins anastomosing and orbicular indusia (if present) peltate s
- s. Petiole with 2 vascular bundles near its base XVI. **Diplazium**
- s. Petiole with 3 or more vascular bundles near its base t
- t. Lamina 2- to 3-pinnate; ultimate segments sharply dentate, or at least the apex mucronate, or if the apex only slightly so then the margins strongly revolute XIII. **Polystichum**
- t. Lamina 1- to 5-pinnate; if 2- to 3-pinnate then the ultimate segments with nearly flat margins that are smooth to obtusely or subacutely dentate u
- u. Veins free or mostly free v
- v. Indusium with a sinus, reniform to more or less orbicular, persistent VIII. **Dryopteris**

- v. Indusium peltate, orbicular, or if with a sinus then fugacious XII. *Cyclodium*
- u. Veins anastomosing w
- w. Indusium absent, or if present then peltate, the pinnae coriaceous with a notably thickened margin IX. *Cyrtomium*
- w. Indusium peltate, pinnae herbaceous, the margins not thickened .. XII. *Cyclodium*
- a. Sporangia distributed over the surface of the fertile lamina or fertile segments (acrostichoid); fertile and sterile leaves dimorphic, usually strongly so x
- x. Pinnae articulate (jointed) y
- y. Veins free; paraphyses lacking XXIII. *Lomariopsis*
- y. Veins anastomosing; usually a few paraphyses scattered among the sporangia XXIV. *Lomagramma*
- x. Pinnae, when present, continuous with the rachis z
- z. Most pinnae or pinna-segments 3 cm long or longer, or the lamina entire and the veins anastomosing with included free veins aa
- aa. Veins free and close, simple or forked only near the costa; the vein tips connected by a marginal strand; sterile lamina 1-pinnate, with the terminal segment conform with the lateral ones (pinnae) XIV. *Olfersia*
- aa. Veins free or anastomosing, a marginal strand absent, or if present then the veins fully anastomosing; sterile lamina with a pinnatifid apex to rarely with a conform apical segment bb
- bb. Fertile lamina more complex than the sterile, 1-pinnate-pinnatifid or more complex, or if 1-pinnate then with a marginal strand in the sterile segments; veins usually free XV. *Polybotrya*
- bb. Fertile and sterile lamina of equal complexity, 1-pinnate or less complex, or if 1-pinnate-pinnatifid then so only in the basal portions of the lamina; veins anastomosing XXII. *Bolbitis*
- z. Pinnae or pinna-segments ca. 0.5–1.5 cm long, or the lamina entire and the veins free, or if anastomosing then without included free veinlets cc
- cc. Sterile lamina simple, entire, pinnately veined, or in one rare species deeply pedately lobed XXV. *Elaphoglossum*
- cc. Sterile lamina flabellate or pinnate, or if entire then flabellately veined XXVI. *Peltapteris*

I. *Ctenitis*

Ctenitis (C. Chr.) C. Chr. in Verd., Man. pterid.
543. 1938. Figure 1.

Dryopteris subgenus *Ctenitis* C. Chr., Biol. Arbejder tilegnede Eug. Warming 77. 1911. TYPE: *Dryopteris ctenitis* (Link) Kuntze (*Aspidium ctenitis* Link) = *Ctenitis distans* (Brack.) Ching.

Plants terrestrial or sometimes epipetric. Stem decumbent to erect, provided with usually many, fibrous roots, the petiole base with a dense cluster of clathrate scales, these 6–30 mm long (although shorter and less abundant in *C. nigrovenia*). Leaves monomorphic or essentially so, ca. 0.2–2.5 m long, caespitose, not articulate to the stem. Lamina 1-pinnate-pinnatifid to 4-pinnate, reduced to a

pinnatifid apex, provided especially on axes with scales and “*Ctenitis* hairs,” the latter being reddish brown, unbranched, articulate trichomes, with 2–4 cells and 0.1–0.4 mm long. Rachis not sulcate or, if so, the adaxial groove not open to admit the groove of the pinna stalk, the adaxial ridges (if any) not continuous with the ridge of the pinna axis, scales ample to abundant. Veins free (or anastomosing in a few Old World species), their tips slender and usually terminating at or near the segment margin, basal basiscopic vein of distal pinnales arising from the costule or very close to its juncture with the costa. Sori roundish, borne along the veins or at their tips, receptacle somewhat elevated, lacking paraphyses. Indusia reniform, or nearly circular and attached at the center, with a narrow sinus, persistent, fugacious, or lacking. Spores ellipsoidal, monolete, surface saccate or

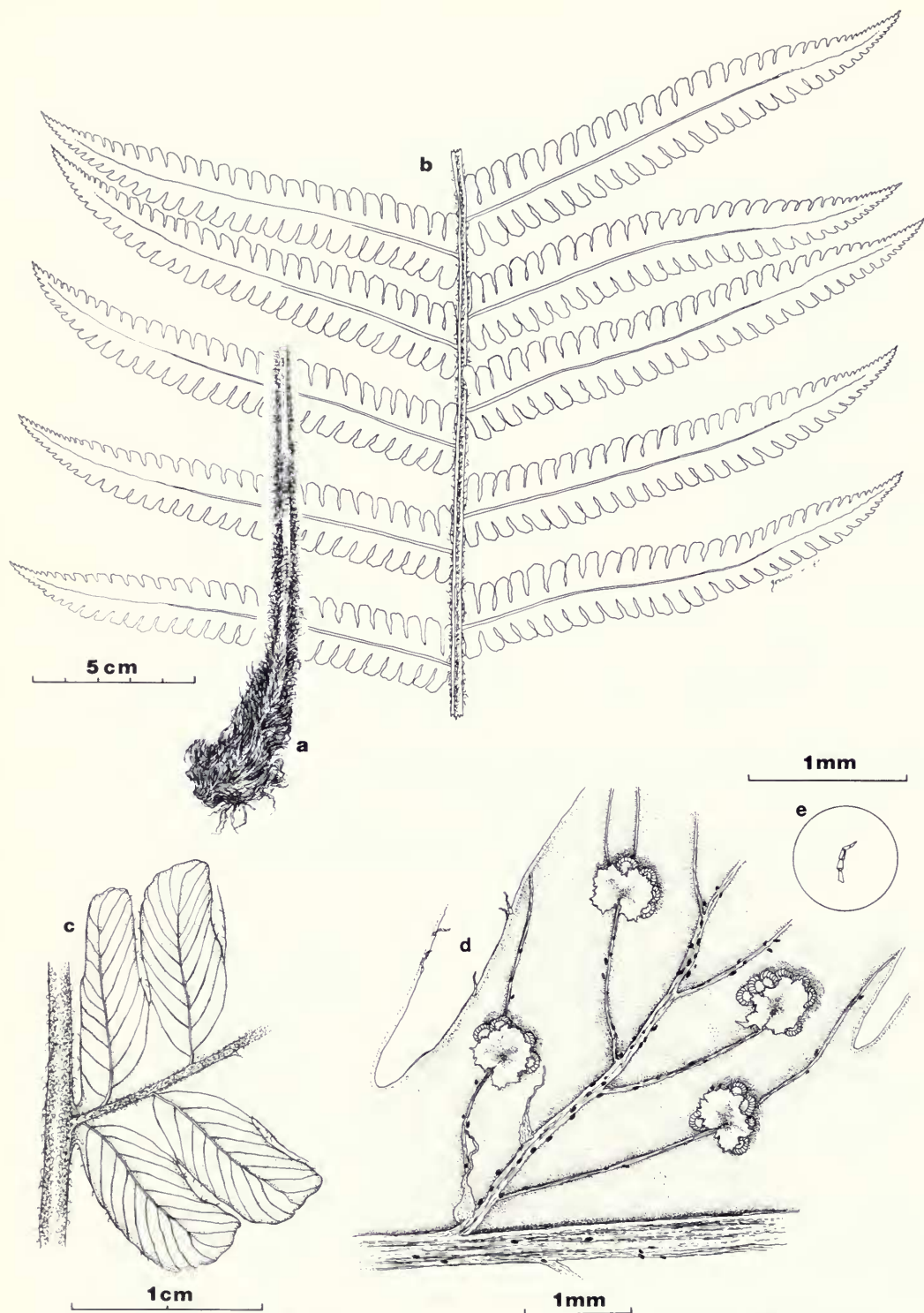


FIG. 1. *Ctenitis submarginalis*: a, stem and portion of petiole; b, portion of lamina; c, base of pinna, abaxial side. *Ctenitis ampla*: d, portion of pinna segment, abaxial side; e, marginal trichome. (a, c from Macbride 4241, F; b from Penland & Summers 262, Ecuador, F; d, e, from Killip & Smith 24072, F.)

echinate, in some species with broad folds that might appear winglike under the light microscope.

Ctenitis is an essentially pantropical genus of 70–80 species, with about half of these in the Neotropics. Its species grow primarily on the floor of rain forests, at lower or middle elevations, and are characterized by large decompound leaves and small, roundish sori with (when present) circular to reniform indusia. The genus has been confused with the closely related *Lastreopsis*, but it can be readily separated by the configuration of the adaxial axes. In *Lastreopsis* ridges are continuous with the ridges on the axes of the next order above or below; but in *Ctenitis* these ridges are lacking or, when present, not continuous onto adjacent axes. Christensen's revisions (1913, 1920) provided great insight into the characters and relationships of the genus, but much more work is still required to produce a satisfactory analysis of the many American species.

Key to Species of *Ctenitis*

- a. Lamina 1-pinnate-pinnatifid, at least above the basal pinnae b
 - b. Ultimate segments (at least of proximal pinnae) crenate or crenate-serrate, lacking marginal trichomes; veins of crenate segments often 1-forked 4. **C. nigrovenia**
 - b. Ultimate segments entire, with minute trichomes scattered to abundant on their margins (at least in segment sinuses); veins unbranched c
 - c. Indusia pubescent, subpersistent; tissue between veins minutely pubescent abaxially and/or adaxially; basal veins terminating at segment margin, well above the sinus 3. **C. microchlaena**
 - c. Indusia lacking, or minute and fugacious; tissue between veins glabrous (glandular in *C. refulgens*); basal veins terminating short of segment margin or reaching it at or near the sinus d
 - d. Pinnae incised $\frac{1}{4}$ – $\frac{1}{2}$ (– $\frac{2}{3}$) to the costa, with minute yellow or reddish glands scattered on (and often between) the veins abaxially; rachis and costa scales entire, not or obscurely clathrate, often with a sub-bullate base 1. **C. refulgens**
 - d. Pinnae incised $\frac{3}{4}$ or more to the costa, eglandular; rachis and costa scales remotely denticulate, conspicuously clathrate, more or less flat throughout 2. **C. submarginalis**
- a. Lamina 2-pinnate-pinnatifid to 4-pinnate e
 - e. Indusia conspicuous and subpersistent; veins and costules eglandular or with conspicuous reddish glands 5. **C. ampla**
 - e. Indusia lacking, or minute and fugacious; veins and (often) costules with minute yellow glands 6. **C. sloanei**

1. **Ctenitis refulgens** (Mett.) (credited in error to C. Chr. by) Vareschi, *Flora Venezuela* 1: 404. 1969.

Recently a number of species were removed from *Ctenitis* and placed in the genera *Triplophyllum* and *Megalastrum*. The evidence supporting this separation is even stronger than that which prompted the separation of *Lastreopsis*. For comparison of these features, see discussions under treatments of *Triplophyllum* and *Megalastrum*.

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CHRISTENSEN, C. 1913. A monograph of the genus *Dryopteris*, part 1. The tropical American pinnatifid-bipinnatifid species. Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd., ser. 7, 10: 55–282.

CHRISTENSEN, C. 1920. A monograph of the genus *Dryopteris*, part 2. The tropical American bipinnate-decompound species. Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd., ser. 8, 6: 3–132.

Chr., p. 89. 1913): Guyana (as British Guiana), *Schomburgk 1183* (b!; frag., b!). Mettenius cited four collections, two were cited as the type by Christensen, one of them, *Schomburgk 1183*, was also cited by Mettenius.

Dryopteris refulgens (Mett.) C. Chr., Index fil. 288. 1905.

Dryopteris refulgens var. *peruviana* C. Chr., Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd. Ser. 7, 10: 90. 1913. SYNTYPES: Peru, Monte Campaña prope Tarapoto (San Martín), *Spruce* 4657 (B, L.); Peru, In Monte Guayrapurima, prope Tarapoto (San Martín), *Spruce* 4712 (w); Peru, prope Tabalosas inter urbem Moyobamba et fluvium Río Huallaga, *Stübel* 1097 (B). ISOSYNTYPES: *Spruce* 4657 (BM!, GH!, P!); *Spruce* 4712 (MO!, US!).

Plants terrestrial. **Stem** erect, this and the petiole base densely clothed with orange to reddish brown, linear scales, these obscurely clathrate, about 1 cm long, with margins entire. **Leaves** caespitose, to 1 m long and 30 cm broad, the axes adaxially and the segment margins amply provided with "*Ctenitis* hairs." **Lamina** 1-pinnate-pinnatifid, the tissue between the veins glabrous, or usually with scattered, yellow to reddish glands, the rachis and costae amply provided abaxially with orange to reddish brown, filiform, entire scales, these not or obscurely clathrate, and usually with a sub-bullate base. **Pinnæ** incised $\frac{1}{4}$ – $\frac{1}{2}$ (– $\frac{2}{3}$) to the costa, the segment entire, or sometimes serrulate at the obtuse or truncate apex. **Veins** simple, 5–8 (–10) pairs per segment, typically reaching the segment margin, but 1–4 basal ones terminating at or near the segment sinus (rarely merging to form a costal areole). **Sori** mostly inframedial between costule and margin. **Indusia** lacking.

In and at edges of wet forests, 135–900 m, San Martín, Loreto, Huánuco.

Southern Mexico (Chiapas); French Guiana to Colombia; Peru; Brazil.

Christensen distinguished his var. *peruviana* from *C. refulgens* on the basis of several quantitative characters: pinnæ less deeply incised, fewer veins running to the sinus and basal ones sometimes united. He also said that the costa scales were fewer, small, and ovate. However, there are no such scales on the syntypes examined, and none of the other variable characters are correlated.

Costa and rachis scales are described above as usually having a sub-bullate base. Although some of the scales are flat throughout as in the closely related *C. submarginalis*, the majority have their basal portion incurved so that the edges meet; hence the scale is essentially filiform with a narrowly cylindrical base, yet not with the expanded, inflated appearance which is commonly termed bullate.

San Martín: Prov. Lamas, Alonso de Alvarado, *J. Schunke* V. 5941 (F). Loreto: Puerto Arturo, Río Hua-

llaga below Yurimaguas, *Killip & Smith* 27821 (US). Huánuco: Prov. Pachitea, Dist. Puerto Inca, *D. Smith* 1299 (GH, MO).

2. *Ctenitis submarginalis* (Langsd. & Fisch.) Ching, Sunyatsenia 5: 250. 1940. **Figure 1a–c.**

Polypodium submarginale Langsd. & Fisch., Icon. fil. 12, t. 13. 1810. TYPE: Brazil, "insula Catharinae," *Langsdorff* (holotype, LE).

Nephrodium tarapotense Hooker, Sp. fil. 4: 107. 1862. TYPE: Peru, "in Monte Campaña prope Tarapoto" (San Martín), *Spruce* "conf. 4016" (holotype, K!). Type not to be confused with *Spruce* 4016 (K, P) which is *C. microchlaena*.

Nephrodium lagerheimii Sodiro, Crypt. vasc. Quit. 252. 1893. TYPE: Ecuador, "Las pendientes occidentales del Tungurahua," *Lagerheim* (holotype, not located; isotypes, C, S!).

Dryopteris submarginalis (Langsd. & Fisch.) C. Chr., Index fil. 296. 1905.

Dryopteris submarginalis var. *tarapotensis* (Hooker) C. Chr., Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd., ser. 7, 10: 98. 1913.

Dryopteris submarginalis var. *lagerheimii* (Sodiro) C. Chr., Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd., ser. 7, 10: 98. 1913.

Plants terrestrial. **Stem** erect to decumbent, this and the petiole base densely clothed with orange or reddish brown, clathrate, linear to lanceolate scales, these 1–2 cm long, with margins entire or sparsely denticulate. **Leaves** caespitose, to 1 m long and 30 cm broad, the axes adaxially and the segment margins abundantly provided with "*Ctenitis* hairs." **Lamina** 1-pinnate-pinnatisect, the tissue between the veins glabrous, the rachis and costae amply provided abaxially with orange or brown, clathrate, flat, linear to filiform, remotely denticulate scales. **Pinnæ** (at least proximal ones) deeply incised to within 1–2 mm of the costa, the segments entire, or serrulate at the obtuse to subacute apex. **Veins** simple, 8–15 pairs per segment, typically reaching the segment margin, basal ones terminating at or near the segment sinus (or often ending short of the sinus). **Sori** inframedial to supramedial between costule and margin. **Indusia** lacking, or very rarely minute and fugacious.

In deep, wet forests, on rocky slopes, 1200–1500 m, Amazonas, San Martín, and Huánuco.

United States (Florida); Hispaniola; southern Mexico to Panama; Venezuela and Colombia south to Argentina and Uruguay.

This is a variable species that was separated by Christensen (1913) into six infraspecific taxa. He based distinctions on shape of segments and number of their veins, indusia present or lacking, po-

sition of sori, and the tissue between veins glabrous or glandular-pubescent. These characters appear to be too variable and uncorrelated for the recognition of taxa. Soral position, for example, varies considerably, even on the same lamina, from inframedial to supramedial. Often sori form an elongated "V", being remote from the costule near the segment base but crowding it toward the apex.

Specimens in southern South America tend to have longer, narrower segments, with acute tips and more veins; elsewhere segments are relatively broad and obtuse, yet these tendencies are too inconsistent to merit even infraspecific status.

Amazonas: Prov. Bongará, Dist. Sipabamba, along Quebrada Fortuna, *Young & Eisenberg 322* (MO, UC). **Huánuco:** Río Huallaga Cañon, below Río Santo Domingo, *Macbride 4241* (F, US). "[I]n Panatahuac Provincia," *Ruíz 68* (B).

3. *Ctenitis microchlaena* (Fée) Stolze, *comb. nov.*

Aspidium microchlaena Fée, *Mém. foug.* 8: 102. 1857.

TYPE: Mexico, Orizaba, *Schaffner 459* (holotype, presumably ♀, but not found; isotype, ♂; photos, F & GH of ♂).

Dryopteris microchlaena (Fée) C. Chr., *Index fil.* 278. 1905.

Aspidium karstenii A. Braun, *Ind. sem. hort. Berol.* app. 3. 1867 (also published in *Ann. Sci. Nat. Bot.* [5] 9: 379. 1868). TYPE: Cultivated Hort. Berol. from spores of plant collected in Venezuela, *Karsten* (B; frag., BM!; isotype, ♂; photos, BM of B, F & GH of ♂).

Dryopteris karstenii (A. Braun) C. Chr., *Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd.*, ser. 7, 10: 98. 1913.

Plants terrestrial. **Stem** erect, this and petiole base densely clothed with orange, clathrate, linear to lanceolate scales, these to 1 cm long, with margins entire or sparsely and minutely denticulate. **Leaves** caespitose, to 90 cm long and 25 cm broad, the margins and the axes on both sides abundantly provided with "*Ctenitis* hairs." **Lamina** 1-pinnate-pinnatisect, minutely glandular-pubescent on one or both of the sides, the rachis and costae provided with filiform to lanceolate scales like those of the stem. **Pinnae** deeply incised to within 1–2 mm of the costa. **Veins** simple, rarely 1-forked, basal ones reaching the margins well beyond the segment sinus. **Sori** medial to supramedial between costule and margin. **Indusia** orange to reddish brown, more or less pubescent, commonly persistent.

On floor of wet, dark forests, ca. 1400 m, Amazonas and San Martín.

Southern Mexico; Costa Rica; Colombia; Venezuela; Peru.

Alan Smith (Pteridophytes of Venezuela, an annotated list. 1985, ined.) placed *Dryopteris karstenii* as a synonym of *C. microchlaena* of Costa Rica and Colombia. There are minor characters that differ, in the original descriptions of both species, such as glabrous, caducous indusia, and glabrous laminar tissue in the latter species, vs. persistent, ciliate indusia and puberulent tissue in *D. karstenii*. However, an examination of type and other material of each indicates that Smith was correct. There is variation throughout the range in relative size and pubescence of indusia, and relative abundance of laminar pubescence, but none of this correlates with any other diagnostic feature.

Amazonas: Prov. Bagua, along Río Utcubamba, on Cerro Tapir, *Hutchison 1482* (UC, US). **San Martín:** Prov. Lamas, Dist. Lamas, near Río Chupiseña, *Belshaw 3503* (F, GH, MO, UC, US). Monte Guayrapurima, near Tarpoto, *Spruce 4016* (K, P); this is a much different plant than *Spruce "conf. 4016"* (K), which is the type of *Nephrodium tarapotense* (= *C. submarginalis*).

4. *Ctenitis nigrovenia* (Christ) Copel., *Gen. fil.* 124. 1947.

Nephrodium nigrovenium Christ, *Bot. Gaz. (Crawfordsville)* 20: 545. 1895. TYPE: Honduras, Santa Barbara, San Pedro Sula, *Thieme* (holotype, ♀; isotype, US!).

Dryopteris nigrovenia (Christ) C. Chr., *Index fil.* 279. 1905.

Plants terrestrial. **Stem** decumbent to erect, this and the petiole abundantly provided with dark brown, clathrate, lanceolate scales, these to 4–7 mm long, subentire. **Leaves** caespitose, to 70 cm long and 20 cm broad, the margins glabrous, the axes adaxially provided with "*Ctenitis* hairs." **Lamina** 1-pinnate-pinnatisect, abaxially provided (usually sparsely) with minute yellow or orange glands, the rachis and costae amply provided with reddish brown or blackish, linear to filiform scales, these 1–3 mm long with an expanded or sub-bulbous base. **Pinnae** incised near or to the costa, ultimate segments entire or proximal ones crenate-serrate. **Veins** simple, or those of crenate segments usually 1-forked, basal ones reaching the margin well beyond the segment sinus. **Sori** medial to inframedial between costule and margin. **Indusia** minute, reddish brown, glabrous, and (in Peru) subsistent.

Thus far represented in Peru by one specimen: on shady river bank, 890 m, San Martín.

Southern Mexico to Panama; Trinidad; Venezuela; Colombia to Peru.

Although *C. nigrovenia* grows from southern Mexico to Peru, nowhere has it been collected in abundance. Distinctive features are the sparsely glandular abaxial surface and the lack of marginal trichomes. The great majority of species in the genus are amply provided with “*Ctenitis* hairs” on segment margins, especially at the sinus. The small indusium is usually persistent in South American representatives of this species, but is often fugacious in those from Central America.

San Martín: Near Moyobamba, banks of Mayo River, Woytkowski 35268 (uc).

5. *Ctenitis ampla* (Willd.) Ching, Sunyatsenia 5: 240. 1940. **Figure 1d.**

Polypodium amplum Willd., Sp. pl. ed. 4, 5: 207. 1810. TYPE: “America meridionale prope Caripe” (Venezuela), *Humboldt* (holotype, b, *Herb. Willd.* 19722; photos, F, GH), not *Dryopteris ampla* of authors (= *C. sloanei* (Sprengel) Morton).

Aspidium catocarpum Kunze, Linnaea 9: 95. 1834. TYPE: Peru, between Cassapi and Pampayacu (Huánuco), *Poeppig*, coll. July 1829 (holotype, LZ, destroyed).

Aspidium nemophilum Kunze, Linnaea 9: 95. 1834. TYPE: Peru (Huánuco), Pampayacu, *Poeppig*, coll. July, 1829 (holotype, LZ, destroyed).

Dryopteris catocarpa (Kunze) Kuntze, Revis. gen. pl. 2: 812. 1891.

Dryopteris nemophila (Kunze) C. Chr., Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd., ser. 8. 6: 57. 1920.

Ctenitis nemophila (Kunze) Ching, Sunyatsenia 5: 250. 1940.

Ctenitis catocarpa (Kunze) Morton, Fieldiana, Bot. 28: 12. 1951.

Plants terrestrial. **Stem** erect, this and the petiole base densely clothed with orange to reddish brown, linear to filiform scales, these subclathrate, 1.5–2.5 cm long, with margins entire. **Leaves** caespitose, to 2.5 m long and 80 cm broad, the axes adaxially and the margins amply provided with “*Ctenitis* hairs,” and abaxially with orange to reddish brown, lanceolate, clathrate scales. **Lamina** deltoid, 2-pinnate-pinnatifid to (at base) nearly 4-pinnate, veins and costules abaxially provided with reddish, cylindric to elliptic glands, or eglandular. **Veins** simple to 1-forked in the ultimate segments. **Indusia** large or small, but conspicuous and persistent, often with elliptic, reddish glands, or short-pubescent or glandular-pubescent.

In dry, open woods or montane rainforests, on slopes, or in ravines, 380–2100 m, Amazonas to Junín and Ucayali.

Venezuela; Colombia to Argentina.

This is part of a species complex that has long been confused; for detailed discussion, see *C. sloanei* below. It is possible that *C. ampla*, as treated here, contains two separate entities. A number of specimens in Peru, and one seen from Bolivia, have large, reddish brown, quite persistent indusia, these lacking marginal trichomes, but with several reddish brown, elliptic glands scattered on the surface. These glands are also conspicuous along the veins and costules abaxially. Typical *C. ampla*, occurring throughout the range, including Peru, has smaller indusia which are usually lighter in color, with short-pubescent or glandular-pubescent indusia. However, elliptic, reddish brown glands are lacking on the segments and indusia. Since the taxonomy of the entire *C. sloanei/ampla* complex is in need of revision, it seems unwise to create another species or variety at this time.

Amazonas: Prov. Chachapoyas, Ingenio-Pomacocha, López et al. 4311 (GH, MO, USM). **San Martín:** Tarapoto, Spruce 3942 (K, US). **Huánuco:** Muña, Bryan 530 (F, GH, US). **Pasco:** Prov. Oxapampa, Canyon de Huancabamba, León 666 (F, USM). **Junín:** La Merced, Killip & Smith 24072 (F, GH, US). **Ucayali** (as Loreto): Prov. Coronel Portillo, Boquerón, Ferreyra 16057, in part (USM).

6. *Ctenitis sloanei* (Sprengel) Morton, Amer. Fern J. 59: 66. 1969.

Polypodium sloanei Sprengel, Syst. veg. ed. 16, 4: 59. 1827. TYPE: “In sylvis densioribus humidis Cuba ad Cahoba,” *Poeppig* (holotype, LZ, destroyed; frag., BM[!]; isotypes, B[!], HBG, L, P[!]; frag., us!; photo, us of HBG).

Ctenitis ampla of authors, not *Polypodium amplum* Willd. 1810, = *C. ampla* (Willd.) Ching.

Plants terrestrial. **Stem** erect, this and the petiole base densely clothed with orange to (en masse) reddish brown, linear to filiform scales, these subclathrate, 1.5–3 cm long, with entire margins. **Leaves** caespitose, to 1.5 m long and 50 cm broad, the axes adaxially and the margins amply provided with “*Ctenitis* hairs,” and abaxially with orange to reddish brown, lanceolate, clathrate scales. **Lamina** deltoid, 2-pinnate-pinnatifid to (at base) nearly 4-pinnate, provided abaxially on veins, and usually costules, with minute (to 0.5 mm) yellowish, cylindrical glands. **Veins** simple to 1-forked in the ultimate segments. **Indusia** lacking, or occasionally minute and fugacious, short-pubescent.

In lowland forests, 100–400 m, Cuzco and Madre de Dios.

United States (Florida); West Indies; southern Mexico (Chiapas); Nicaragua to Panama; Venezuela; Colombia; Ecuador; Peru.

This is one of a variable complex of neotropical species whose relationships Christensen (1920) and Morton (Amer. Fern J. 59: 66. 1969) tried to clarify. Despite their efforts a good revision is still needed. Only a comparison of types against mass collections will suffice to delineate species and ascertain the correct application of names. There are few good characters with which to separate *C. ampla*, *C. sloanei*, *C. catocarpa*, and *C. nemophila*, and it is not surprising that Christensen was uncertain whether all were conspecific, or were closely related taxa with few intermediates. Separation of *C. ampla* and *C. sloanei* has been attempted on a suite of characters: color and shape of scales, presence or lack of glands and indusia, shape of apex and stalk length of pinnules. Examination of specimens from many areas of the Neotropics indicates that perhaps only the indusia and laminar glands are reliable and relatively constant, but even these are at times questionable characters. Throughout the species complex indusia may be large and persistent to small and fugacious or lacking, and even persistent indusia can be folded and inconspicuous within a large sorus of fully expanded sporangia.

Large, red glands on the veins can easily be seen under low magnification in many specimens of *C. ampla*, but the smaller yellowish ones blend with the tissue in *C. sloanei* and frequently can be located only with diligence and higher (30×) magnification. As treated here, *C. sloanei* is widespread in the Neotropics, yet it is rare in Peru. *Ctenitis ampla* is rather common in Peru, but not especially abundant elsewhere. *Ctenitis sloanei* tends to prefer lower elevations throughout its range (less than 500 m in the two Peruvian collections), whereas *C. ampla* is mostly, although not always, found above 800 m.

Cuzco: Prov. La Convención, Río Apurímac below San Martín, Davis *et al.* 1332 (F). Madre de Dios: Prov. Manú, Parque Nacional del Manú, Foster 9802 (F, MO).

II. *Megalastrum*

Megalastrum Holttum, Gard. Bull. Straits Settlement. 39: 161. 1986. TYPE: *Megalastrum villosum* (L.) Holttum, (*Polypodium villosum* L.).
Figure 2.

Plants terrestrial. Stem decumbent to erect, occasionally subarborescent to 2 m tall, provided with many fibrous roots, the petiole usually with a dense cluster of clathrate scales 6–30 mm long. Leaves monomorphic, ca. 0.5–3.0 m long, caespitose, not articulate to the stem. Lamina 1-pinnate-pinnatifid to 4-pinnate-pinnatifid, reduced to a pinnatifid apex, often provided on the margins and/or abaxial surface with “*Ctenitis* hairs,” the latter being reddish brown, articulate trichomes with 2–4 cells and 0.1–0.4 mm long, but the adaxial axes (except in one Brazilian species) bearing trichomes with usually more than 4 cells and typically over 0.5 mm long, these drying terete or flat, and with pointed tips. Rachis not sulcate or, if so, the adaxial groove not open to admit the groove of the pinna stalk, the adaxial ridges (if any) not continuous with the ridge of the pinna axis, scales ample to abundant. Veins free, their tips conspicuously clavate, ending short of the segment margin, basal basiscopic vein of distal pinnules arising from the costa. Sori roundish, borne along the veins, receptacle somewhat elevated, lacking paraphyses. Indusia reniform, or nearly circular and attached at the narrow sinus, or lacking. Spores monolete, roundish to ellipsoidal, echinate or cristate.

Megalastrum is a tropical genus of 45–50 species, most of these in America. It was separated from *Ctenitis* by Holttum (1986), a decision substantiated by Smith and Moran (1987) in a paper that added new combinations for 39 species. The different trichomes on the adaxial axes is the most effective character for distinguishing the two genera (see key to genera of Dryopteridaceae), but there are a number of other corroborating features. In *Megalastrum*, the clavate vein tips terminate obviously short of the segment margin, whereas in *Ctenitis* the tips are not or scarcely enlarged and terminate at or very near the margin. In *Ctenitis* the sporangia stalks, and sometimes indusia and veins, bear unicellular, glandular trichomes, but these are lacking in *Megalastrum*.

Although the two genera now may be effectively separated as outlined above, many problems still exist in delineating their components. Both contain variable species complexes in which taxa are distinguished merely by length and abundance of indument. Detailed examination of specimens throughout the Neotropics will very likely prove that a number of taxa currently recognized as species are merely varieties or forms of others.

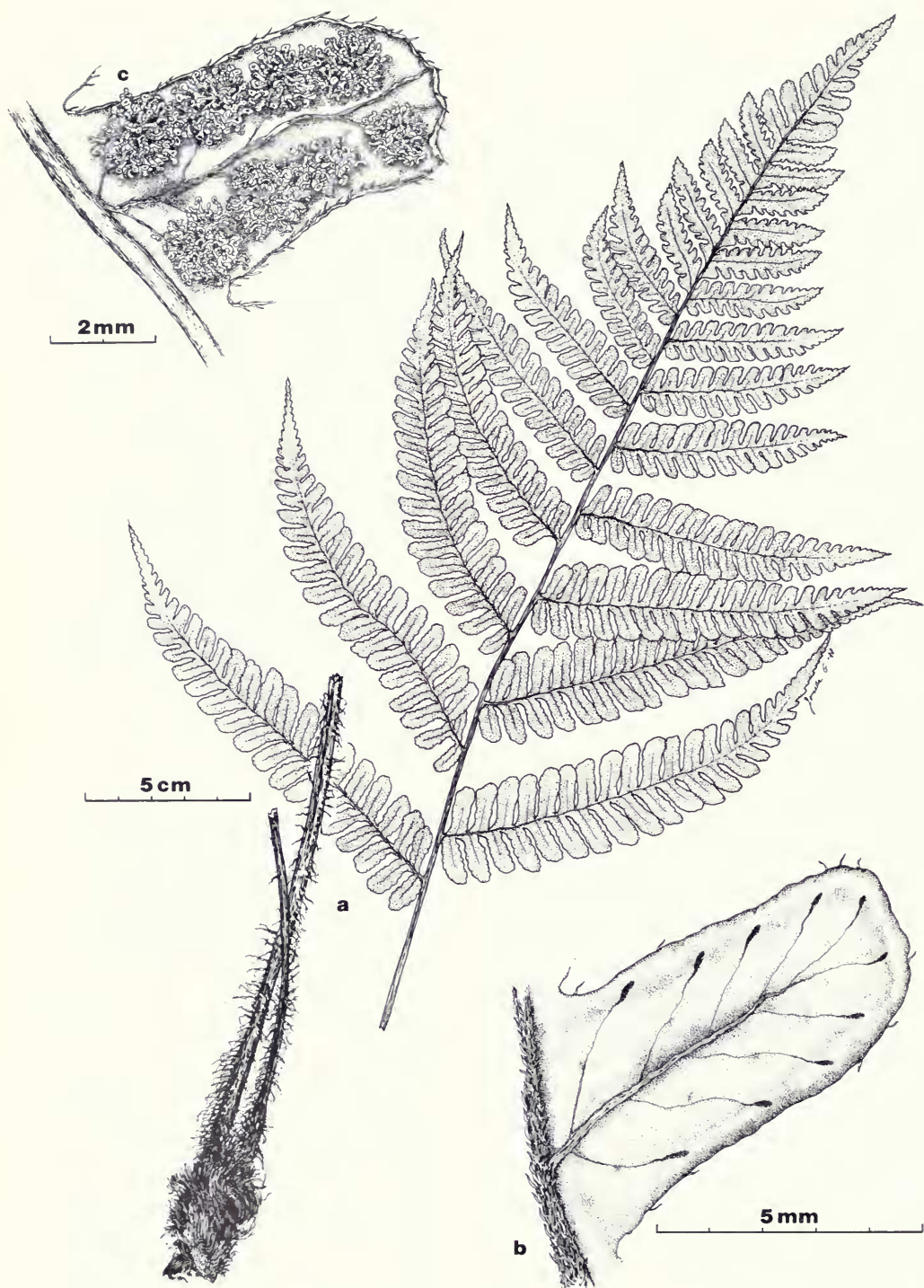


FIG. 2. *Megalastrum biseriale*: a, habit; b, ultimate segment, adaxial side; c, ultimate segment, abaxial side. (a, c from J. Schunke A227, us; b from Soukup 1032, f.)

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Key to Species of *Megalastrum*

- a. Lamina 1-pinnate-pinnatifid to (proximally) 2-pinnate; pinnules entire to crenate, or proximal ones shallowly lobed b
 - b. Trichomes on the abaxial side of axes and veins 1–2 mm long, moderate to abundant; trichomes on segment margins to 1 mm long; stem scales often with narrow blackish margins 6. *M. hirsutosetosum*
 - b. Trichomes on the abaxial side of axes sparse, 0.1–0.8 mm long, or lacking, or if abundant and to 1 mm long, then mixed with many other trichomes ca. 0.2 mm long; trichomes on segment margins less than 0.3 mm long; stem scale margins not blackish c
 - c. Lamina chartaceous; most veins obscure; tissue on abaxial side commonly with minute (0.1 mm), cylindrical glands d
 - d. Sori mostly inframedial; rachis scales filiform, to 6 mm long; trichomes lacking or sparse on the axes abaxially 1. *M. honestum*
 - d. Sori mostly supramedial; rachis scales lanceolate, 2–3 mm long; trichomes abundant on the axes abaxially 2. *M. yungense*
 - c. Lamina firm-herbaceous; most veins evident; tissue eglandular e
 - e. Rachis scales scattered, 1–1.5 mm long 4. *M. platylobum*
 - e. Rachis scales moderate to abundant, 2–4 mm long f
 - f. Axes abaxially densely covered with trichomes to 0.2 mm long; abaxial surface of lamina abundantly provided with minute trichomes 3. *M. microsorum*
 - f. Axes abaxially glabrous, or with scattered trichomes to 0.6 mm long; abaxial surface glabrous 5. *M. biseriale*
- a. Lamina 2-pinnate-pinnatisect to 4-pinnate-pinnatifid; pinnules regularly pinnatisect to 1-pinnate or more complex g
 - g. Indusia large, persistent 10. *M. andicola*
 - g. Indusia lacking h
 - h. Lamina short-pubescent, the trichomes (at least abaxially) 0.1–0.5 mm long i
 - i. Costules, costae, and rachis abaxially glabrous, or the trichomes scattered and varying in length from 0.3 to 0.6 mm long 7. *M. subincisum*
 - i. Costules, costae, and usually the rachis, densely and regularly puberulent abaxially, the trichomes 0.05–0.2 mm long 8. *M. vastum*
 - h. Lamina abaxially long-pilose, especially on costae and veins, the trichomes moderate to abundant, mostly 0.7–1.5 mm long 9. *M. pulverulentum*

1. *Megalastrum honestum* (Kunze) Smith & Moran, Amer. Fern J. 77: 128. 1987.

Polypodium honestum Kunze, Linnaea 9: 49. 1834.

TYPE: Peru (Huánuco), Pampayaco (Pampayacu), *Poeppig* 22 (holotype, LZ, destroyed).

Polypodium fibrillosum Baker, Syn. fil. 307. 1867.

TYPE: Peru (San Martín), Tarapoto, *Spruce* 4742 (holotype, K!; isotypes, BM!, BR, GH!; photo, US of BR).

Dryopteris fibrillosa (Baker) C. Chr., Index fil. 264. 1905.

Dryopteris honesta (Kunze) C. Chr., Index fil. 271. 1905.
Ctenitis honesta (Kunze) R. & A. Tryon, Rhodora 84: 127. 1982.

Plants terrestrial. **Stem** erect, this and the petiole base densely clothed with orange, linear scales, these obscurely clathrate, to 1.5 cm long, the margins entire or rarely with a few, minute, scattered setae. **Leaves** to 1.2 m long and 40 cm broad, the axes on the abaxial side sparsely provided with trichomes to 0.3 mm long or, more commonly, glabrous. **Lamina** chartaceous, the tissue and veins abaxially often with minute, scattered, yellow to reddish cylindrical glands (ca. 0.1 mm), 1-pinnate-pinnatisect, to 2-pinnate near the base, the rachis and costae abaxially provided with abundant, reddish brown, filiform, setulose scales, these 2–6 mm long (to 4 mm on costae). Pinnae incised nearly or quite to the costae, the ultimate segments entire to crenate, with scattered marginal trichomes 0.1–0.2 mm long. **Veins** obscure. **Sori** mostly infra-medial. **Indusia** lacking.

In forests, 400–1700 m, San Martín, Huánuco, Junín, Madre de Dios.
Peru; Bolivia.

In this and *Megalastrum yungense* the tissue is so dense that most veins can usually be seen only by transmitted light. The lamina of other species in the complex is much thinner and veins are mostly quite evident. Axes on the abaxial side typically lack trichomes, although filiform scales are quite abundant. On only one of all Peruvian collections examined (Ucayali, cited below) was a sparse covering of minute trichomes detected.

Huánuco: Pampayacu, *Kanehira* 179 (us). La Divisoria, 25 km NE of Tingo María, *Moran* 3707 (usm). **Junín:** Schunke Hacienda above San Ramón, *Killip & Smith* 24659 (us). Chanchamayo Valley, *C. Schunke* 957 (f). **Ucayali:** Fundo Chela, Sinchono (as Loreto or Huánuco), *Aguilar*, Aug. 3, 1948 (gh, usm). **Madre de Dios:** Prov. Manú, Río Sotileja, Parque Nacional Manú, *Foster et al.* 11598 (f).

2. *Megalastrum yungense* (Christ & Rosenst.)
Smith & Moran, Amer. Fern J. 77: 129. 1987.

Dryopteris yungensis Christ & Rosenst., Repert. Spec. Nov. Regni Veg. 5: 234. 1908. TYPE: Bolivia, Sirapuya near Yanacachi, 2000 m, *Buchtien* 493 (holotype, pl; isotype, us).

Plants terrestrial. **Stem** erect, this and the petiole base densely clothed with brown (sometimes mot-

tled with black), linear scales, these scarcely or obscurely clathrate, ca. 6 mm long, the margins setulose. **Leaves** to 80 cm long and 25 cm broad, the axes on the abaxial side amply provided with trichomes 0.2–0.6 mm long. **Lamina** chartaceous, the tissue and veins abaxially often with minute, scattered, cylindrical glands (ca. 0.1 mm), 1-pinnate-pinnatisect, to 2-pinnate near the base, the rachis and costae abaxially amply provided with reddish brown, setulose, lanceolate scales, these 2–3 mm long (less on costae). **Pinnae** incised nearly or quite to the costae, the ultimate segments entire, obtuse, with scattered marginal trichomes 0.1 mm long. **Veins** obscure. **Sori** mostly supra-medial. **Indusia** lacking.

Thus far known in Peru from one collection, in high montane forest, 1800 m, San Martín.
Peru; Bolivia.

Rachis scales in this species complex are typically filiform, many times longer than broad; but those of *M. yungense* are lanceolate to narrow-deltoid. Scales of the stem and petiole base are also distinctive, at least in the specimen from Peru: essentially dark brown, but with scattered black cells or groups of cells. Because the type consists only of a leaf broken off above the stem, it is not possible to ascertain if this color pattern is consistent.

San Martín: Prov. Rioja, Pedro Ruíz-Moyobamba Rd., km 390, *D. Smith* 4424 (uc).

3. *Megalastrum microsorum* (Kuntze) Stolze,
comb. nov.

Nephrodium microsorum Hooker, Sp. fil. 4: 106. 1862, *nom. illeg.*, not Endl. 1833. TYPE: Ecuador, at the foot of Chimborazo, *Spruce* (holotype, k!; frag., bm!; photos, f & gh of k).

Dryopteris microsora Kuntze, Revis. gen. pl. 2: 813. 1891, *nom. nov.* for *Nephrodium microsorum* Hooker and with the same type.

Dryopteris leptosora C. Chr., Index fil. 274. 1905, *nom. nov.* for *Nephrodium microsorum* Hooker and with the same type.

Megalastrum leptosorum (C. Chr.) Smith & Moran, Amer. Fern J. 77: 128. 1987.

Plants terrestrial. **Stem** erect, this and the petiole base densely clothed with orange to brown, linear scales, these narrowly clathrate, to 2 cm long, the margins conspicuously setose, the setae often bifurcate. **Leaves** to 1 m long and 30 cm broad, the axes on the abaxial side abundantly provided with whitish, pluricellular trichomes 0.1–0.2 mm long.

Lamina firm-herbaceous, the abaxial surface abundantly and minutely pubescent, 1-pinnate-pinnatisect to 2-pinnate, the rachis and costae abaxially provided with abundant reddish brown, filiform, setulose scales, these 2–4 mm long. **Pinnæ** incised nearly or quite to the costae, the ultimate segments entire to crenate, with scattered marginal trichomes ca. 0.1 mm long. **Veins** evident, although sometimes indistinct. **Sori** supramedial to somewhat inframedial. **Indusia** lacking.

Thus far known in Peru from the single specimen cited below: beneath a moist rock wall, 2800 m, Junín.

Ecuador; Peru.

Megalastrum microsorum can be distinguished from its nearest relatives by the abundant, though minute, pubescence of the abaxial surface, on and between the veins. An interesting feature is the character of the stem, petiole, and (sometimes) rachis scales. These are conspicuously setulose as in many species of the genus, but the setae are commonly bifid at the apex. This condition also has been observed on petiole scales of *M. platylobum*, although only rarely.

Junín: Paucartambo, Woytkowski 6742 (vs).

4. *Megalastrum platylobum* (Baker) Smith & Moran, Amer. Fern J. 77: 128. 1987.

Polypodium platylobum Baker, Syn. fil. 307. 1867. TYPE: Mt. Guayrapurima, near Tarapoto (San Martín), *Spruce 4656* (holotype, k!; isotypes, BM!, k!, P!).

Polypodium tarapotense Baker, Syn. fil. ed. 2:505. 1874. TYPE: based on one sheet of type of *P. platylobum* (k!, see discussion below).

Dryopteris platyloba (Baker) C. Chr., Index fil. 285. 1905.

Dryopteris tarapotensis (Baker) C. Chr., Index fil. 297. 1905.

Plants terrestrial. **Stem** erect, this and the petiole base densely clothed with orange to brown, linear scales, these narrowly and obscurely clathrate, to 1 cm long, the margins setulose, the setae occasionally bifid at apex. **Leaves** to 1.5 m long and 40 cm broad, the axes on the abaxial side densely covered with whitish trichomes of mixed lengths, many ca. 1 mm long, and many more only 0.1 mm long. **Lamina** firm-herbaceous, 1-pinnate-pinnatisect, or 2-pinnate near the base, occasionally bearing some scattered, minute (0.05 mm) trichomes on the tissue abaxially, the rachis abax-

ially provided with scattered, reddish brown, filiform scales, these 1–1.5 mm long and with setulose margins. **Pinnæ** incised nearly or quite to the costae, the ultimate segments entire to crenate or rarely shallowly lobed, their margins amply ciliate with trichomes ca. 0.5 mm long. **Veins** evident. **Sori** supramedial. **Indusia** lacking.

Thus far known in Peru only from the type collections, San Martín.

Venezuela; Peru.

At Kew there are five sheets of *Spruce 4656*. Three, from Hooker's herbarium, represent the holotype of *Polypodium platylobum*; the two others, in another folder and marked "sheet 1" and "sheet 2," are isotypes. After having described *P. platylobum*, Baker seven years later described *P. tarapotense*, based on one of the sheets of *Spruce 4656*, which contains the distal portion of the leaf, plus the petiole of a species of Cyatheaceae (*Cnemidaria speciosa*?). For a full discussion, see C. Christensen's monograph (1913, p. 110).

Megalastrum platylobum can be further distinguished from closely related species by the mixed trichomes on the axes abaxially, especially on the costae: many spreading pluricellular ones ca. 1 mm long, plus a dense covering of 1(–2)-cellular ones ca. 0.1 mm long. Axes trichomes of *M. hirsutetosum* are all long (1–2 mm), and those of others in the species complex are short (commonly 0.3–0.5 mm).

5. *Megalastrum biserialis* (Baker) Smith & Moran, Amer. Fern J. 77: 127. 1987. **Figure 2.**

Polypodium biserialis Baker, Syn. fil. 309. 1867. TYPE: Ecuador, Mt. Tungurahua, *Spruce* (holotype, k!).

Dryopteris biserialis (Baker) C. Chr., Index fil. 254. 1905.

Ctenitis biserialis (Baker) Lell., Fern gaz. 11: 108. 1975.

Plants terrestrial. **Stem** erect, this and the petiole base densely provided with orange or light brown, linear scales, these obscurely clathrate, to 1.5 cm long, the margins setulose. **Leaves** to 1 m long and 30 cm broad, the axes on the abaxial side sparsely provided with whitish trichomes 0.2–0.6 mm long, or glabrate. **Lamina** firm-herbaceous, the tissue glabrous and eglandular, 1-pinnate-pinnatisect to 2-pinnate, the rachis and costae abundantly provided on the abaxial side with reddish brown, filiform scales, these 3–4 mm long (on costae 1–2 mm), margins remotely setulose. **Pinnæ** incised nearly or quite to the costae, ultimate segments

entire to crenate or shallowly lobed, with scattered marginal trichomes 0.1 mm long. **Veins** evident. **Sori** mostly inframedial. **Indusia** lacking.

In forests and wooded ravines, 600–1800 m, Pasco, Junín, Madre de Dios.

Panama; Colombia; Ecuador; Peru.

Pasco: San Nicolás, Pichis Trail (as Junín), *Killip & Smith* 26021 (us). **Junín:** Chanchamayo Valley, *C. Schunke* 45, 87 (f, us). Schunke Hacienda, above San Ramón, *C. Schunke* A227 (us). La Merced, Chanchamayo, *Soukup* 1032 (f). **Madre de Dios:** Prov. Manú, Atalaya, *Foster & Wachter* 7423 (f, mo).

6. *Megalastrum hirsutosetosum* (Hieron.) Smith & Moran, Amer. Fern J. 77: 128. 1987.

Dryopteris hirsuto-setosa Hieron., Hedwigia 46: 343, t. 6. 1907. TYPE: Ecuador, plateau above Allpayacu between Baños and Jivaria de Pintuc, *Stübel* 903 (holotype, B!; frag. & photo, BM).

Ctenitis hirsuto-setosa (Hieron.) Lell., Proc. Biol. Soc. Wash. 89: 709. 1977.

Plants terrestrial. **Stem** erect, provided at apex with a dense cluster of deep orange to reddish brown scales, these obscurely clathrate, to 1 cm long, with narrow, often blackish, densely setulose margins. **Leaves** caespitose, to 1.2 m long and 30 cm broad, the axes and veins on both sides moderately to abundantly provided with rigid, pluricellular trichomes 1–2 mm long. **Lamina** 1-pinnate-pinnatisect to 2-pinnate, the axes lacking scales, or the rachis with a few, scattered, filiform ones. **Pinnae** incised nearly or quite to the costae, the ultimate segments subentire, crenate or very shallowly lobed, the margins with abundant spreading trichomes to 1 mm long. **Veins** indistinct to obscure, 1-several-forked. **Sori** usually medial between costule and margin. **Indusia** lacking.

In forests, 1000–1500 m, Amazonas, Huánuco, Pasco, Junín, Ucayali.

Colombia; Ecuador; Peru.

This can be easily distinguished from all the less dissected species of *Megalastrum* by the abundant, spreading trichomes which clothe the axes and veins, abaxially and adaxially. There is a single specimen from San Martín (*Knapp & Mallet* 7022, mo) that closely resembles *M. hirsutosetosum*, in that the axes and margins have abundant, long trichomes. However, the tissue is glandular abaxially, and the axes are conspicuously filiform-scaly. The few scattered sporangia all appear to be bar-

ren, so the plant is probably a hybrid, perhaps involving *M. platylobum*.

Amazonas: Prov. Bagua, 12 km E of La Peca, *Barbour* 2499 (f, mo). **Huánuco:** Prov. Leoncio Prado, Tingo María, *Aguilar* 25 (usm). Pampayacu, *Kanehira* 184 (gh). **Pasco:** Pichis Trail, San Nicolás (as Junín), *Killip & Smith* 26037 (us). **Junín:** La Merced, Chanchamayo, *C. Schunke* 22 (uc). **Ucayali:** Prov. Coronel Portillo (as Loreto), Sinchono, between Tingo María and Pucallpa, *Aguilar* 865 (usm).

7. *Megalastrum subincisum* (Willd.) Smith & Moran, Amer. Fern J. 77: 129. 1987.

Polypodium subincisum Willd., Sp. pl. ed. 4, 5: 202.

1810. TYPE: Venezuela, Caracas, *Bredemeyer* (holotype, B, *Herb. Willd.* 19701; photos, f, us). *Dryopteris subincisa* (Willd.) Urban, Symb. antill. 4: 19. 1903.

Ctenitis subincisa (Willd.) Ching, Sunyatsenia 5: 250. 1940.

Plants terrestrial. **Stem** erect, this and the petiole base densely clothed with bright brown to castaneous, linear to filiform scales, these clathrate, 1.5–2.5 cm long, the margins setose. **Leaves** to 3 m long and 1.2 m broad, the axes adaxially provided with a dense covering of terete, curved trichomes mostly 0.5–0.8 mm long. **Lamina** 2-pinnate-pinnatisect to 3-pinnate-pinnatifid, the costules, costae, and rachis abaxially glabrous, or with trichomes scattered and varying in length from 0.3 to 0.6 mm long, the scales of the rachis and costae dark brown, clathrate, linear or filiform (from a sometimes dilated base) and mostly 2–6 cells wide, the margins commonly setose. **Pinnae** with tissue between the veins typically glabrous abaxially, but occasionally sparsely to abundantly puberulent. **Sori** medial to inframedial on the segments. **Indusia** lacking.

In rain forests and wooded ravines, 500–2100 m, Amazonas, San Martín, Junín, Cuzco.

West Indies; southern Mexico to Panama; Venezuela; Colombia to Bolivia.

This is one of the most widely distributed species in the genus, and is part of a complex that is rather variable in laminar indument. This group includes *M. vastum* from Peru and the Andes and *M. spectabile* (Kaulf.) Smith & Moran from southern South America. Christensen stated (1920, p. 68) that *M. vastum* might be merely a variety of *M. subincisa*; the other species appears to differ in no greater degree. The only diagnostic features, as

noted in the key, are those of size and abundance of trichomes and shape and margin of scales, and there is some variability even in these.

Although pubescence is generally confined to the axes and veins on the above species, some specimens are sparsely to abundantly puberulent on the tissue between the veins. This condition has been noted in both *M. subincisum* and *M. vastum*. The entire species complex is in need of study throughout its range; meanwhile the two species are maintained as distinct for purposes of this treatment.

Amazonas: Prov. Bagua, valley of Río Marañón above Cascadas de Mayasi, *Wurdack 1851* (us). **San Martín:** "In Monte Campana, prope Tarapoto." *Spruce 4340* (κ). **Junín:** Schunke Hacienda, above San Ramón, *C. Schunke A225* (us). **Cuzco:** Prov. Urubamba, along Río Urubamba near town of Machu Picchu, *Tryon & Tryon 5412* (F, GH). Prov. Paucartambo, Kosñipata-Pilcopata, *Vargas 11284* (GH).

8. *Megalastrum vastum* (Kunze) Smith & Moran,
Amer. Fern J. 77: 129. 1987.

Polypodium vastum Kunze, Linnaea 9: 50. 1834.
TYPE: Peru (Huánuco), "inter Pampayaco (Pampayacu) et Cocheros et ad Ventanilla de Cassapi," *Poeppig 217* (holotype, B!; isotypes, B!, L; photos, F & US of L).

Dryopteris vasta (Kunze) Hieron., Hedwigia 46: 347. 1907.

Dryopteris mollicoma C. Chr., Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd. ser. 8, 6: 75. 1920. TYPE: Ecuador, "in silv. suband. orient." Oyacachi, *Sodiño* (holotype, P; frag., BM; isotype, A!; photo, F of BM).

Ctenitis mollicoma (C. Chr.) Ching, Sunyatsenia 5: 250. 1940.

Megalastrum mollicomum (C. Chr.) Smith & Moran,
Amer. Fern J. 77: 128. 1987.

Plants terrestrial. **Stem** erect, this and the petiole base densely clothed with bright brown to castaneous, lanceolate to filiform scales, these clathrate, 1–3 cm long, the margins denticulate to setulose. **Leaves** to 2 m long and 0.8 m broad, the axes adaxially provided with curved trichomes mostly 0.5–0.8 mm long or glabrescent. **Lamina** 2-pinnate-pinnatisect to (proximally) 3-pinnate-pinnatifid, the costules, costae, and (often) the rachis densely and regularly puberulent abaxially, the trichomes 0.05–0.2 mm long, the scales of the rachis and costae dark brown, clathrate or subclathrate, lanceolate to filiform and mostly 3–10 cells wide, the margins entire to denticulate or sometimes setose. **Pinnae** with tissue between the veins typically glabrous abaxially, but sometimes sparsely

to abundantly puberulent, or occasionally hirsute, adaxially. **Sori** typically medial. **Indusia** lacking.

Dense forests, 750–1850 m, Amazonas, Huánuco, Junín, and Ayacucho.

Costa Rica; Colombia to Bolivia; Paraguay.

Killip & Smith 22779, cited below, differs from typical *M. vastum* in the dense puberulence abaxially on the tissue between the veins. In the *M. subincisum* complex, some scattered trichomes are often evident on the laminar tissue, but never so conspicuously as seen on this particular specimen. This character should be considered, along with other conditions of indument, in future studies of the various species complexes of both *Ctenitis* and *Megalastrum*.

Probably *M. vastum* should be recognized merely as a variety of *M. subincisum*, under which see further discussion. Only the type and a few other collections have been found in Peru; the species seems to be most abundant in Ecuador.

Amazonas: Prov. Bagua, 12 mi E of La Peca, *Barbour 2504* (F, MO). **Huánuco:** Cushi, *Macbride 4846, 4855* (F, US). **Junín:** Prov. Chanchamayo, Chilpex, 26 km S of San Ramón, *Smith & Palacios 2639* (F, MO). **Ayacucho:** "Aina" (Ayna), between Huanta and Río Apurímac, *Killip & Smith 22779* (us).

9. *Megalastrum pulverulentum* (Poirét) Smith & Moran,
Amer. Fern J. 77: 129. 1987.

Polypodium pulverulentum Poirét in Lam., Encycl. 5: 555. 1804. TYPE: *Plumier*, *Traité foug. Amér. t. 34*. 1705, based on a plant from Hispaniola.

Polypodium karstenianum Klotzsch, Linnaea 20: 390. 1847. TYPE: "Colombia" (Venezuela), *Karsten II, 3* (holotype, B; probable isotype, HBG; photo, F & US of HBG).

Dryopteris karsteniana (Klotzsch) Hieron., Hedwigia 46: 348. 1907.

Dryopteris pulverulenta (Poirét) C. Chr., in Urban, Symb. antill. 9: 305. 1925.

Ctenitis pulverulenta (Poirét) Copel., Gen. fil. 124. 1947.

Ctenitis karsteniana (Klotzsch) Vareschi, Flora Venezuela 1: 405. 1969.

Plants terrestrial. **Stem** erect, arborescent, in Peru to 1 m tall, this and the petiole base densely clothed with orange to brown, linear scales, these subclathrate, 1–2.5 cm long, the margins entire to remotely setulose. **Leaves** to 3 m long and 1.5 m broad, the axes on both sides moderately to abundantly pilose. **Lamina** 3-pinnate to nearly 4-pinnate-pinnatifid, the rachis deciduously pilose and with scattered scales 1–2 mm long, these with con-

spicuously setose margins. Pinnae commonly 2-pinnate-pinnatisect, but basal ones often basiscopically enlarged and more highly dissected, the costae and veins moderately to abundantly provided with spreading pluricellular trichomes mostly 0.7–1.5 mm long or a little shorter adaxially. **Sori** inframedial, medial, or rarely supramedial. **Indusia** lacking.

In forests, 540–1800(–2700) m; San Martín, Cuzco.

Greater Antilles; southern Mexico to Costa Rica; Venezuela; Colombia to Bolivia.

This, like *M. hirsutosetosum*, is distinguished by the long (1–2 mm), spreading trichomes on the axes and veins. However, leaves of the latter are never more than 2-pinnate, and scales of the petiole base have blackish, densely setulose margins. Leaves of *M. pulverulentum* are often 4-pinnate-pinnatisect at base, and the petiole scales are concolorous, with subentire to remotely denticulate margins.

The few specimens found thus far in Peru are var. *pulverulentum*, a common variety widely distributed throughout the Neotropics. Variety *heydei* (C. Chr.) Smith & Moran, with essentially glabrous laminae, is confined to Guatemala (or possibly also in Ecuador).

Young & León 4958, cited below, appears to be intermediate between *M. pulverulentum* and the Central American *M. pansamalense* (C. Chr.) Smith & Moran, the latter differing chiefly in its denser covering of long trichomes and its broad, entire laminar scales. The *Young & León* collection has much smaller leaves, and abundant lanceolate to ovate scales with entire margins, but is similar in every other character to *M. pulverulentum*. Although fully mature, the cited specimens have leaves only 50 cm long and 18 cm broad, whereas both of the above species have leaves from 1 to 3 m long. It is possible that *Young & León 4958* (2650–2750 m) represents a depauperate specimen or a high elevation variant; it is uncommon to find *M. pulverulentum* above 1500 m.

San Martín: Tarapoto, *Spruce 4718* (BM, K, P). Prov. Mariscal Cáceres, Río Abiseo National Park, *Young & León 4958* (F, GH). **Cuzco:** San Miguel, Urubamba Valley, *Cook & Gilbert 1128* (US). Prov. Paucartambo, Hacienda Villa Carmen, *Vargas 14685* (GH). **Department unknown:** Peru, undesignated locality, *Soukup 296* (F).

10. *Megalastrum andicola* (C. Chr.) Smith & Moran, Amer. Fern J. 77: 127. 1987.

Plants terrestrial. **Stem** erect, this and the petiole base densely clothed with orange to brown, linear to lanceolate scales, these subclathrate, 1–2.5 cm long, the margins setulose. **Leaves** to 1.5 m long and 40 cm broad, the axes on both sides amply to abundantly pubescent. **Lamina** 2-pinnate-pinnatisect to 3-pinnate-pinnatifid, the rachis and costae sparsely to amply scaly, the scales orange to brown, linear, 4–5 mm long, their margins denticulate to subentire. **Pinnae** mostly 1-pinnate-pinnatisect, but basal ones more deeply divided and enlarged at the base basiscopically, the ultimate segments minutely pubescent on both sides on the veins, and sometimes on the intervening tissue. **Indusia** persistent, light to dark brown, 1 mm or more in diameter, often glandulose.

This is part of a variable complex of neotropical species that is in need of further study. It is one of the few indusiate species of *Megalastrum*, and the only indusiate one in Peru. A number of varieties and forms have been described, based chiefly on differences in length and abundance of indument. *Megalastrum andicola* is probably only varietally distinct from the West Indian *M. villosum* (L.) Holttum; the latter apparently differs only in its larger size, greater dissection of lamina, and in the fewer and early deciduous scales on the axes. Pending future study of the species complex, *M. andicola* and one other form are tentatively recognized in Peru.

Key to Forms of *Megalastrum andicola*

- a. Trichomes on axes, veins, and leaf tissue ca. 1 mm long 10a. f. **andicola**
- a. Trichomes on axes, veins, and leaf tissue 0.2–0.3 mm long 10b. f. **lehmannianum**

10a. **Megalastrum andicola** f. *andicola*

Nephrodium villosum var. *opacum* Hieron., Bot. Jahrb. Syst. 34: 446. 1904. LECTOTYPE (designated here): Colombia, Fusagasuga, *Lindig 159* (B).

Nephrodium villosum f. *spruceanum* Hieron., Bot. Jahrb. Syst. 34: 446. 1904. LECTOTYPE (designated here): Ecuador, *Spruce 5295* (B!; isotypes, C, K!).

Dryopteris andicola C. Chr., Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd. ser. 8, 6: 88. 1920. TYPE: Ecuador, *Spruce 5295* (holotype, B!; isotypes, C, K!).

Dryopteris andicola f. *spruceana* (Hieron.) C. Chr., reference as above, p. 89.

Ctenitis andicola (C. Chr.) Ching, Sunyatsenia 5: 250. 1940.

In rain forests and cloud forests, 750–2300 m, Amazonas, San Martín, Junín, and Pasco.

Colombia; Ecuador; Peru.

Amazonas: Prov. Bagua, 12 mi E of La Peca, *Barbour 2587* (F, UC). Prov. Bongará, hills 1–5 km SSE of Yambasbamba, *Wurdack 1030* (GH, US). **San Martín:** Tarpoto, *L1. Williams 5985* (F). **Pasco:** Oxapampa, *Soukup 3354* (GH, US). **Junín:** Prov. Tarma, Valle del Río Chanchamayo, *Esposto 663* (USM).

10b. **Megalastrum andicola** f. *lehmannianum* (Hieron.) Stolze, *comb. nov.*

Nephrodium villosum f. *lehmannianum* Hieron., Bot. Jahrb. Syst. 34: 446. 1904. LECTOTYPE (designated here): Colombia, *Lehmann 7369* (holotype, B; isolectotypes, K!, US!).

Dryopteris andicola f. *lehmanniana* (Hieron.) C. Chr., Bot. Jahrb. Syst. 34: 89. 1904.

Thus far represented in Peru by the single collection cited below: Podocarpus forest, 1880–1950 m, Junín.

Colombia; Ecuador; Peru.

Hieronymus originally distinguished his new form by size of indusia and number of sori on a segment. It has been seen that these characters are too variable and inconsistent to be of taxonomic value. The only other difference observed between *f. lehmannianum* and *f. andicola* is the length of trichomes on the lamina, but at least this character is consistent and conspicuous. The tissue, veins, and minor axes of *f. andicola* are densely covered on both sides with whitish, spreading trichomes ca. 1 mm long. In *f. lehmannianum* equivalent axes are as densely pubescent, but the trichomes are never more than 0.3 mm long, and those on the tissue abaxially are noticeably less abundant.

Junín: Prov. Chanchamayo, Río Rondayacu, 45 km from San Ramón, *D. Smith et al. 2615* (F, GH, MO).

III. **Triplophyllum**

Triplophyllum Holttum, Kew Bull. 41: 239. 1986.

TYPE: *Triplophyllum protensum* (Sw.) Holttum (*Aspidium protensum* Sw.). **Figure 3.**

Plants terrestrial. **Stem** creeping, sparsely to moderately provided with narrow, nonclathrate scales, these commonly 1–4 mm long. **Leaves** 1-pinnate-pinnatifid to nearly 4-pinnate (as to basal portion), borne at approximate to subdistal intervals, monomorphic, to ca. 1.6 m long and 0.8 m broad, long-petiolate, not articulate to the stem. **Lamina** deltoid-pentagonal (to somewhat elongate in a few Old World species), the basal pinnae conspicuously larger than adjacent ones, and more than half as long as the rest of the lamina, provided especially on the axes with scales and “*Ctenitis* hairs,” the latter being reddish brown, unbranched, articulate trichomes, with 2–4 cells and 0.1–0.4 mm long. **Rachis** not sulcate or, if slightly so, the adaxial groove not open to admit the groove of the pinna stalk, the adaxial ridges (if any) not continuous with the ridge of the pinna axis, scales few or lacking. **Veins** free, or in a few species rarely anastomosing, but without free veins in the areoles. **Sori** roundish, borne along the veins or at their tips, receptacle somewhat elevated, lacking paraphyses. **Indusia** reniform (in Peru species) or rarely lacking. **Spores** monolet, roundish to ellipsoid, the surface bearing thin, winglike ridges.

Triplophyllum is a genus of 20 tropical species, five of them in America, with but a single variety occurring in Peru, and one species perhaps to be expected. The more obvious characters separating it from *Ctenitis* are seen in the key to genera of Dryopteridaceae. In addition, *Ctenitis* often has cylindric glands on indusia, and on axes and tissue between the veins. If glands are present on the lamina or indusia in *Triplophyllum*, they are spherical.

According to Holttum (1986) there are two other varieties of *T. funestum*: var. *perpilosum* Holtt. of Colombia, with many trichomes between the veins on both surfaces, and var. *hirsutum* Holtt. of Guyana, with trichomes to 1 mm long on the axes.

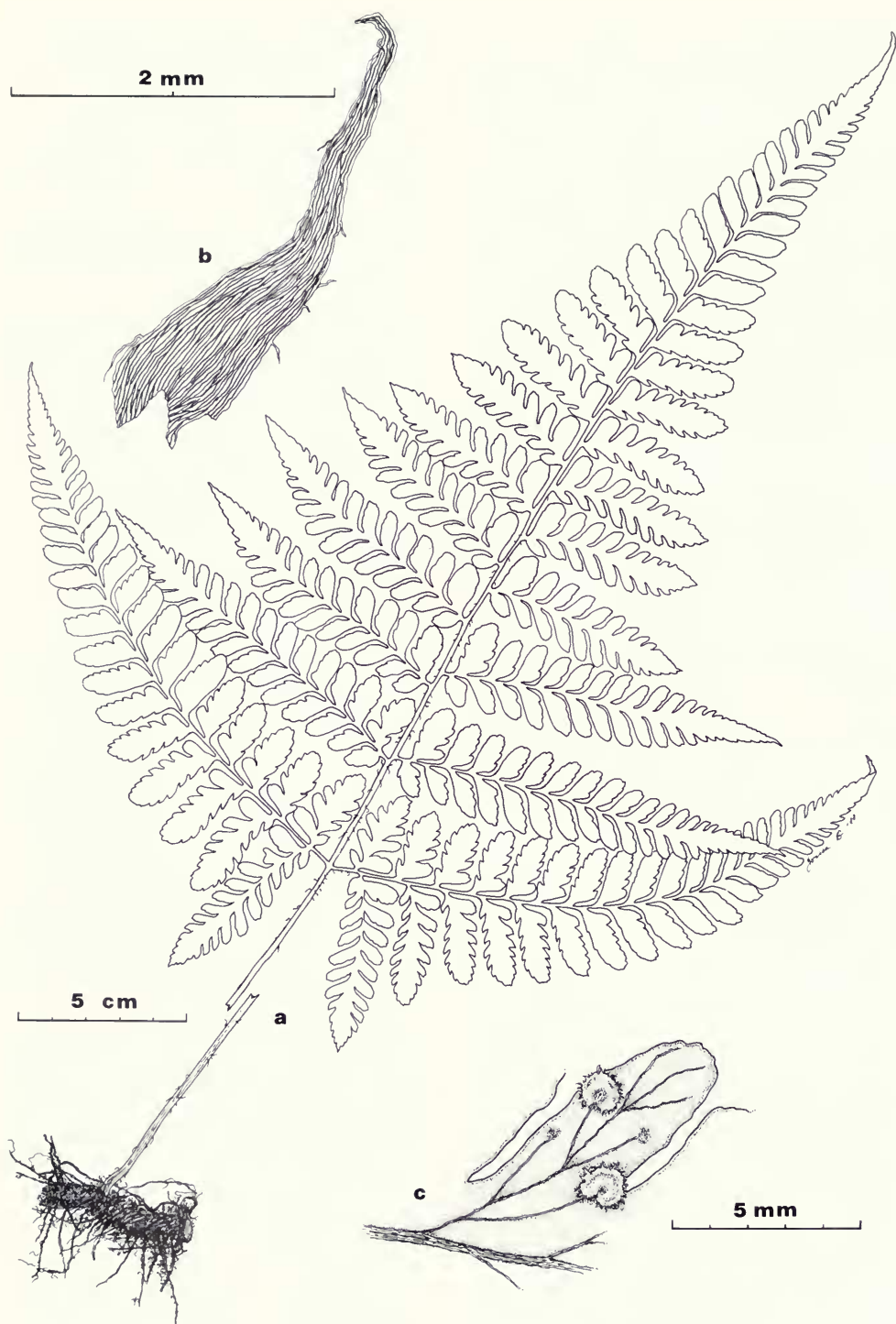


FIG. 3. *Triplophyllum funestum* var. *funestum*: a, habit; b, petiole scale; c, ultimate segment, abaxial side. (a, b from Petelot s.n., Brazil, F; c from Klug 174, F.)

Reference

HOLTUM, R. E. 1986. Studies in the fern-genera allied to *Tectaria* Cav., 5. *Triplophyllum*, a new genus of Africa and America, Kew Bull., **41**: 237–260.

1. *Triplophyllum funestum* (Kunze) Holttum var. *funestum*, Kew Bull. 41: 256. 1986. Figure 3.

Aspidium funestum Kunze, Linnaea 9: 96: 1834. TYPE: “ad Ega, Brasiliae, lect. 1832,” *Poeppig* (holotype, presumably w).

Nephrodium funestum (Kunze) Hooker, Sp. fil. 4: 129, t. 259. 1862.

Dryopteris protensa var. *funesta* (Kunze) C. Chr., Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd., ser. 8, 6: 91: 1920.

Ctenitis protensa (Sw.) Ching, var. *funesta* (Kunze) Proctor, Rhodora 63: 34. 1961.

Plants terrestrial. **Stem** creeping, this and the petiole and rachis sparsely to moderately provided with reddish brown, lanceolate scales, these non-clathrate, 1–4 mm long. **Leaves** approximate to somewhat spaced along the stem, to 1 m long and 50 cm broad, with “*Ctenitis* hairs” ample on the axes and few on the veins and segment margins. **Lamina** deltoid-pentagonal, 1-pinnate-pinnatifid to 2-pinnate-pinnatifid, but 3-pinnate-pinnatifid as to the greatly enlarged basal pinnae. Central **pinnae** commonly 1-pinnate-pinnatifid, the basal pinnules more strongly developed acroscopically, ultimate segments obtuse, the basal pinnae often nearly as large as the rest of the lamina, much more strongly developed basiscopically. **Veins** branched in the ultimate segments, terminating at or near the margin, with slender tips. **Sori** borne near the segment margins. **Indusia** orange to reddish brown, conspicuous, persistent, with minute pluricellular trichomes.

In wet soil of rain forests, sea level to 700 m, San Martín, Loreto, Pasco, and Madre de Dios.

Puerto Rico; Lesser Antilles; Nicaragua to Panama; Trinidad; the Guianas to Colombia, and southward to Brazil and Bolivia.

Some specimens from Peru approach *T. acutibolum* Holttum, a large species of Brazil, with basal pinnae 44 cm long or more, axes adaxially glabrous, and segments and lobes mostly acute. *Allard 22003* and *Vargas 18629* (cited below) lack adaxial trichomes and have some segments acute, but both have small leaves with basal pinnae about 15 cm long. Other specimens examined have one

or the other of these features, but not both. Obviously these characters are too variable to serve as a basis for the further division of var. *funestum*.

San Martín: On ridge east of Tingo María, *Allard 22003* (GH, US). **Loreto:** Mishuyacu, near Iquitos, *Klug 174* (F, US). Prov. Maynas, Río Momon, *Saunders 1365, 1367, 1368* (GH). **Pasco:** Prov. Oxapampa, Quebrada Castilla on Omaiz River, *León & Young 1020* (GH). **Madre de Dios:** Prov. Tambopata, Tambopata Nature Reserve, *Barbour 4921, 5189* (F). Prov. Tambopata *Vargas 18629* (GH).

Comments

Triplophyllum dicksonioides (Fée) Holttum, Kew Bull. 4: 257. 1986.

Aspidium dicksonioides Fée, Crypt. vasc. Brésil 1: 143, t. 49. 1869. TYPE: Northern Brazil, Rio Negro near San Gabriel, *Spruce 2129* (holotype, not located; isotypes, BM, K), cited in error (*vide* Christensen) as *Glaziou 2129*.

Dryopteris protensa (Sw.) C. Chr. var. *dicksonioides* (Fée) C. Chr., Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd., ser. 8, 6: 93: 1920.

This species occurs from the Guianas to Colombia, and in northwest Brazil, so there is good reason to believe it may be found in Amazonian Peru, perhaps in Loreto where *T. funestum* grows. It is distinguished from the latter by the tiny, spherical glands on the indusia and lamina, by the sori, which are mostly apical on the veins, and by the more highly dissected lamina (up to 4-pinnate) with much smaller ultimate segments. In contrast, *T. funestum* var. *funestum* is minutely pubescent on the veins and indusia, but eglandular; sori are seldom apical on the veins, and the lamina is 1-pinnate-pinnatifid to (in basal pinnae) 3-pinnate-pinnatifid.

IV. *Tectaria*

Tectaria Cav., Anales Hist. Nat. 1: 115. 1799. TYPE: *Tectaria trifoliata* (L.) Cav. (1802) (*Polypodium trifoliatum* L.). Figure 4.

Aspidium Sw., J. Bot. (Schrader) 1800(2): 4, 29. 1802, nom. superfl. for *Tectaria* and with the same type.

Stem erect or decumbent, usually stout, to moderately long-creeping and slender, bearing scales. **Leaves** ca. 10 cm to 2 m long, petiole continuous. **Lamina** simple and entire to deeply lobed, or to

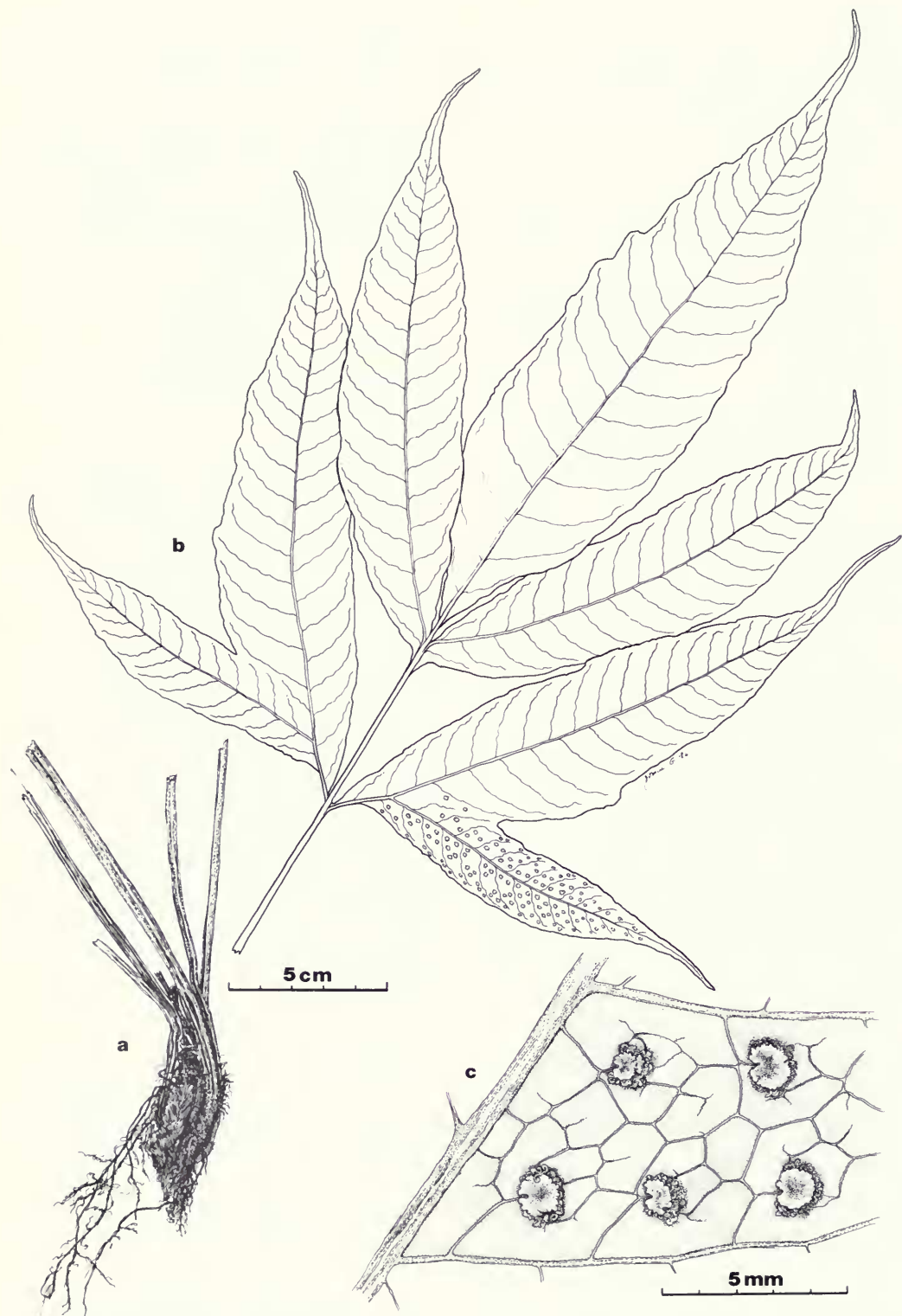


FIG. 4. *Tectaria incisa* var. *incisa*: a, portion of stem and petiole; b, lamina; c, portion of pinna, abaxial side. (a from Tryon & Tryon 5206, F; b from Alfaro s.n., Costa Rica, F; c from Moran 3653, F.)

3-pinnate-pinnatifid, glabrous, scaly, or pubescent, usually monomorphic, or dimorphic with the fertile usually more erect, longer and less expanded than the sterile, pinnae not articulate, adaxial side of the costa raised. **Veins** usually anastomosing, usually with included free veinlets, rarely free. **Sori** (in Peru) usually roundish, borne on the veins and covered by reniform to peltate (rarely some elongate) indusia, or exindusiate and roundish or rarely some elongate, not paraphysate (elsewhere the sori may be linear, rarely on a marginal projection or the sporangia partly acrostichoid). **Spores** ellipsoidal, monolete, ridged, cristate or echinate.

Tectaria is a large genus of about 150 species, some 20 of them in America and six in Peru. It is pantropical and sometimes subtropical. The sorus and lamina architecture is unusually variable in the genus, and several segregate genera have been recognized on the basis of these variations. Tryon and Tryon (1982) list the ones that occur in Central America, the Greater Antilles, and northern South America.

Tectaria is a difficult genus in the Andes because of a lack of critical studies, the uncertainty of the application of some names, the probability of un-

recognized hybrids, and the lack of cytological information. This treatment, based largely on Peruvian materials, will need to be refined, especially as field studies of populations and cytological information on the different morphological kinds become available. The cytological complexities of American *Tectaria*, with diploids, triploids, and tetraploids, are partly indicated by Jermy and Walker (1985 and references).

Soral variation is shown in *Mexia* 8217, MO (*T. antioquiiana*) and *Smith et al.* 1709, MO (*T. lizarzaburui*); in both, the sorus and the indusia vary from roundish to reniform to quite elongate.

References

- JERMY, A. C., AND T. G. WALKER. 1985. Cytotaxonomic studies of the ferns of Trinidad. *Bull. Brit. Mus. (Nat. Hist.) Bot.*, **13**: 133–286.
MORTON, C. V. 1966. The Mexican species of *Tectaria*. *Amer. Fern J.*, **56**: 120–137.
TRYON, R. M., AND A. F. TRYON. 1982. *Tectaria*, pp. 470–481, in *Ferns and allied plants*, Springer-Verlag, New York.

Key to Species of *Tectaria*

- a. Veins mostly or wholly free 1. ***T. brauniana***
- a. Veins fully anastomosing, except for included free veinlets b
- b. Lamina 1-pinnate or more complex, or the rachis fully alate, or if the lamina simple then with a pair of basal lobes and an abrupt base c
- c. Sori of the lateral pinnae or large pinna-segments in 2 series between the costules, each series extending from the costa to the margin in a usually regular line, or a third series present only near the costa; sori indusiate, most or all of the indusia with a sinus, often attached laterally d
- d. Lamina simple, with 2 basal lobes, or with a single pair of stalked or sessile pinnae, or with 2 or more such pairs and then the basal pinnae entire to shallowly lobed or pinnatifid, these and the usually entire pinnae distally mostly with obtuse lobes 2. ***T. incisa***
- d. Lamina with 2 or more pairs of stalked or sessile pinnae, the basal pinnae deeply pinnatifid or more complex, with 2 or more large, basiscopic lobes, these pinnae and distal ones mostly regularly lobed with acute to acuminate, sometimes subacute or obtuse lobes 3. ***T. lizarzaburui***
- c. Sori of the lateral pinnae or large pinna-segments in 3–6, usually 4 or 5, series between the costules, each series extending from the costa toward the margin in a regular or sometimes irregular line; sori indusiate or not e
- e. Basal pinnae stalked or sessile, the rachis immediately above them not alate; sori indusiate, or most exindusiate, or a few small indusia present; proliferous buds sometimes present at the base of the pinnae 4. ***T. antioquiiana***
- e. Basal pinnae joined to the pair above by the alate rachis; sori exindusiate; proliferous buds absent 5. ***T. draconoptera***
- b. Lamina entire, long-decurrent at the base; sori exindusiate 6. ***T. plantaginea***

1. *Tectaria brauniana* (Karsten) C. Chr., Index fil. suppl. 3: 177. 1934.

Aspidium braunianum Karsten, Fl. columb. 1: 63, t. 31. 1859. TYPE: Colombia, "Villavizencio" (Villavicencio). Karsten (not located).

Stem rather long-creeping. **Leaves** ca. 25–70 cm long. **Lamina** mostly 2-pinnatifid, to 3-pinnatifid at the base, gradually reduced at the apex, pubescent on the axes on both sides but especially abaxially; basal pinna-segments pinnatifid, more developed on the basiscopic side; lateral pinna-segments obtusely to sometimes acutely lobed; proliferous buds absent. **Veins** mostly to usually wholly free. **Leaf-tissue** glabrous to somewhat pubescent. **Sori** indusiate, in a single series between the costules and margin. **Indusium** with a broad to narrow sinus, usually glabrous.

Primary forests, wet ravines, one label indicates that the plant was an epiphyte, 250–800 m, Huánuco, Cuzco, and Madre de Dios.

Costa Rica to Bolivia.

The essentially free venation is distinctive for this species, as is the 2–3-pinnatifid lamina architecture.

Huánuco: Ca. 15 km N of Tingo María, Woytkowski 1363 (UC). **Cuzco:** Prov. Paucartambo, Cosñipata Valley, N of Patria, Wachter et al. 196 (F). **Madre de Dios:** Prov. Tambopata, Dist. Tambopata, Yung 21 (MO, UC).

2. *Tectaria incisa* Cav., Descr. pl. 249. 1802. TYPE: Puerto Rico, comm. (and probably collected by) *Ventenant* (holotype, MA, seen by C. Chr. [Dansk Bot. Ark. 9(3): 14. 1937]). **Figure 4a–c.**

Aspidium martinicense Sprengel, Anleit. Kenntn. Gew. 3: 133. 1804. TYPE (cited by Morton, 1966): Dominican Republic, Poiteau (not located). Plummer, Traité foug. Amér. t. 145, also cited by Sprengel, is this species.

Tectaria martinicensis (Sprengel) Copel., Philipp. J. Sci. 2 C: 410. 1907.

Stem ascending to erect. **Leaves** ca. 20 cm to 2 m long. **Lamina** simple, with 2 basal lobes, or with 2 basal entire pinnae and an entire terminal segment, or usually with 2 or more stalked or sessile pinnae, then the basal pinnae entire or usually with 1 large, basiscopic lobe on 1 or both of the pinnae, or with 2 lobes on 1 or both of the pinnae, or less often with 2 or more large, basal lobes and smaller

lobes beyond on both sides; lateral pinnae usually entire, sometimes lobed, the stalked terminal segment entire to variously lobed; proliferous buds sometimes present at or near the base of the pinnae, or only 1 bud present; the stalked terminal segment and some distal pinnae may be long-decurrent on the rachis. **Veins** fully anastomosing, except for the included free veinlets. **Leaf-tissue** glabrous to very short-pubescent to pilose on both surfaces. **Sori** indusiate, the indusia mostly or all with a sinus, often attached laterally, in 2 series between costules from the costa to the margin, or a third series present only near the costa, in usually regular lines. **Indusium** glabrous or sometimes shortly glandular-pubescent on the margin and surface.

In primary forests, in cloud forests, on hillsides, in ravines, often among rocks, along roadsides, and sometimes on wet, shady cliffs, 100–2100 m, Cajamarca south to Madre de Dios.

Tropical America.

In Peru *Tectaria incisa* is a highly variable species in the architecture of the basal pinnae of the lamina and of the stalked terminal segment, in the presence or absence of proliferous buds at or near the base of the pinnae, and in the pubescence or lack of it on the leaf tissue. Population studies, including information on developmental stages, as well as on cytology and hybridization are needed to determine the basis for the extreme variation and the evolutionary validity of some of the variations.

The characters employed to define taxa in this complex all vary from one extreme to another, and sometimes a single collection will consist of more than one named taxon. For these reasons the species *Tectaria incisa* is treated broadly. The principal variations with their names are distinguished below and by our annotations. This treatment serves to organize the variation of the species so that it may be studied more readily, and at the same time avoids the formal recognition of groups that may not be evolutionary units. Although these groups are not recognized as taxa in Peru, in regions to the north the circumstances may be different.

a. Typical *Tectaria incisa* has both basal pinnae, or at least one of them, with a large, basiscopic lobe, the two sides beyond are entire or nearly so, the stalked terminal segment is usually lobed, often with two, sometimes one, large basal lobe(s), the pinnae have the leaf-tissue glabrous or essentially so above and beneath, small plants may have the lamina with two basal lobes, or with two basal

pinnae and a large terminal segment. Specimens have been annotated as *Tectaria incisa*.

This variation (var. *incisa*) occurs throughout the range of the species in Peru, except for Cajamarca, where it is not yet known.

Amazonas: Prov. Bagua, Río Marañón, above Cascadas de Mayasi, *Wurdack* 1861 (US). **San Martín:** Chazuta, Río Huallaga, *Klug* 4038 (F, GH, MO). **Loreto:** Prov. Maynas, 10 km S of Iquitos, *Tryon & Tryon* 5206 (F, GH, US). Above Pongo de Manseriche, *Mexia* 6343 (F, GH, MO, UC, US). **Huánuco:** Prov. Huánuco, near confluence of Río Huallaga and Río Cayumba, *Mexia* 8304 (BM, F, GH, MO, UC, US). Cerca Tingo María, *Aguilar* 307 (USM). **Pasco:** Yapas, Pichis Trail (as Junín), *Killip & Smith* 25584 (US). **Junín:** Prov. Tarma, 4 km N of La Merced, *Tryon & Tryon* 5443 (GH, US). **Ucayali:** Prov. Coronel Portillo, Bosque Nacional von Humboldt, *Vásquez* 3882 (F, MO). **Ayacucho:** Near Kimpitiriki, *Killip & Smith* 22975 (GH, US). **Cuzco:** Prov. La Convención, Río Apurímac, above Boca de Tigre rapids, *Davis et al.* 1315, 1317 (F, GH). **Madre de Dios:** Parque Nacional del Manú, Cocha Cashu Station, *Foster & Terborgh* 6613 (GH).

b. Plants with leaves that are similar to typical *T. incisa* may have the leaf tissue pubescent above and beneath. These have sometimes been named *Tectaria incisa* var. *pilosa* (Fée) Morton. The indument varies from pilose to very short-pubescent and from quite dense to very sparse. Specimens have been annotated as *Tectaria incisa*-pilose. They are scattered through the range of the species and do not seem to represent a taxon.

This variation ranges in Peru from Cajamarca south to Madre de Dios. A few collections are the following:

Cajamarca: *Woytkowski* 6905 (US). **Huánuco:** *Allard* 21868 (US), 21871 (US), *Ferreira* 10238 (GH). **Loreto:** *Wurdack* 2146 (GH), *Mexia* 6354 (GH, MO, UC, US). **Pasco:** *Killip & Smith* 26516 (F, US), *León* 307 (USM). **Madre de Dios:** *Chávez* 1846 (MO).

c. Proliferous buds are present at or near the base of the pinnae on some or all leaves of a plant. This variation has been named *Tectaria incisa* f. *vivipara* (Jenm.) Morton, and as a species, *Tectaria vivipara* Jermy & Walker. There may be tight, scaly buds or the buds may have developed into small plantlets; sometimes there is a single bud on the lamina. This variation is sporadic in its distribution and does not seem to be a taxon. Collections have been annotated as *Tectaria incisa*-viviparous.

In Peru it is known from Loreto, Huánuco, Pasco, and Madre de Dios. The following document the occurrence of this variation in Peru:

Loreto: *J. Schunke* V. 2688 (F, GH, US), *Mexia* 6250 (F, GH, MO, UC, US). **Huánuco:** *Gentry et al.* 41435 (MO). **Pasco:** (as Junín), *Killip & Smith* 26690 (F, US). **Madre de Dios:** *Foster et al.* 3401 (F), *Núñez* 5728 (MO).

d. The basal pinnae, and sometimes those above, are definitely lobed beyond the one or more large, basal basiscopic lobes, and the stalked terminal segment is lobed. This variation has been named *Tectaria incisa* ssp. *transiens* Morton, and has been treated as a species, *Tectaria transiens* (Morton) A. R. Sm. The leaf-tissue may be pilose above and beneath or glabrous. It does not seem to merit recognition as a taxon in Peru. Specimens have been annotated as *Tectaria incisa* “transiens.”

It occurs from Cajamarca south to Madre de Dios. The following represent this variation:

Cajamarca: *Soukup* 3813 (US). **Amazonas:** *Barbour* 2496 (MO). **Loreto:** *J. Schunke* 325 (F, GH, US). **Madre de Dios:** *Foster & Wachter* 7420 (F, MO).

e. All of the pinnae and the stalked terminal segment may be entire or nearly so, and proliferous buds usually occur near or at the base of the pinnae, or a single bud may be present. This is *Tectaria andina* (Sodirol) C. Chr. The leaf-tissue is glabrous on both surfaces. It occurs in Ecuador and Peru and may represent a taxon. However, it seems to intergrade with typical *Tectaria incisa* and so is not treated formally here. Specimens have been annotated as *Tectaria incisa* “andina.”

It is known from Amazonas, Loreto, and Huánuco in Peru. A few of the collections are:

Amazonas: *Soukup* 6611 (GH), *Wurdack* 1823 (GH, US). **Loreto:** *Mexia* 6131a, in part: (GH, US). **Huánuco:** *Skog et al.* 5141 (US), *Gentry et al.* 36148 (MO).

3. *Tectaria lizarzaburui* (Sodirol) C. Chr., Index fil. suppl. 3: 181. 1934.

Nephrodium lizarzaburui Sodirol, Recens. crypt. vasc. Quit. 55. 1883. TYPE: Ecuador, Atacazo, Hacienda Boloña, *Sodirol* (holotype, not located). Ecuador, *Sodirol* (k!), photo GH may be authentic, it is not wholly typical.

Stem ascending to erect. **Leaves** to 2.5 m long. **Lamina** mostly 1-pinnate, more complex at the base; terminal stalked segment acutely lobed on each side, with two large, acuminate basal lobes, somewhat decurrent on the rachis (cuneate at the base); basal pinnae usually deeply pinnatifid on the basiscopic side with 2 to several large, acu-

minate lobes, sometimes to 2-pinnate-pinnatifid, the acroscopic side mostly acutely to subacutely lobed; lateral pinnae mostly regularly, acuminate-ly to obtusely lobed; proliferous buds absent. **Veins** fully anastomosing, except for included free veinlets. **Leaf-tissue** glabrous to sometimes short-pubescent abaxially. **Sori** indusiate, in 2 series between the costules from the costa to the margin, in usually regular lines, or a third series present only near the costa. **Indusium** with a sinus, often attached laterally, glabrous to slightly pubescent on the surface, the edge glabrous to ciliate.

In primary forests, in cloud forests, and in secondary growth, 1000–2000 m, Amazonas south to Ayacucho.

Venezuela and Colombia, south to Peru.
This species is close to *Tectaria incisa*, especially to variation “d” with the basal pinnae lobed beyond the large, basal lobe. That variant of *T. incisa* differs, however, in having obtuse lobes and the leaf is usually 1 m or less long. *Tectaria lizarzaburui* has most lobes acuminate to subacute and a large leaf to 2.5 m long.

Cajamarca: Prov. Santa Cruz, 3.5 km ENE of Monteseuco, *Santisteban & Guevara 130* (F). **Amazonas:** Prov. Bagua, 12 km E of La Peca, *Barbour 2692* (F, MO, UC). Prov. Bongará, 5 km N of N end of Lake Pomacocha, on road to Rioja, *Hutchison & Wright 6787* (GH, UC, US). **Pasco:** Prov. Oxapampa, Río El Tungui, *Smith et al. 1709* (MO). **Junin:** Above San Ramón, *C. Schunke A217* (US), *Killip & Smith 24639* (F, US). Chanchamayo Valley, *C. Schunke 36* (F, US), 876, 980 (F). **Ayacucho:** Prov. La Mar, eastern Massif of the Cordillera Central, *Dudley 11907* (GH).

4. *Tectaria antioquoiana* (Baker) C. Chr., Index fil. suppl. 3: 177. 1934.

Nephrodium sodiroi Baker, J. Bot. 15: 16. 1877. TYPE: Andes of Ecuador, *Sodi-ro* (holotype, Ecuador, fl. Pilatón, *Sodi-ro*, k!; photo, GH), *nom. rejec.* (see discussion).
Nephrodium antioquoianum Baker, J. Bot. 19: 205. 1881. TYPE: Colombia, Antioquia, *Kalbreyer 1806* (holotype, k!; photo, GH). The epithet altered to *antioquianum* by Baker, Ann. Bot. (London) 5: 329. 1891.
Polypodium haynaldii Sodiro, Recens. crypt. vasc. Quit. 61. 1883. TYPE: Ecuador, San Miguel de los Colorados, *Sodi-ro* (holotype, not located; isotype, k!; photo, GH).
Tectaria sodiroi (Baker) Maxon, Proc. Biol. Soc. Wash. 43: 88. 1930, *nom. rejec.*
Tectaria haynaldii (Sodiro) C. Chr., Index fil. suppl. 3: 180. 1934.

Stem ascending to erect. **Leaves** ca. 50 cm to 1.5 m long. **Lamina** 1-pinnate, with 1 to 2 pairs of stalked or sessile pinnae; stalked terminal segment and adnate large pinna-segments, when present, long-decurrent on the rachis, the stalked terminal segment usually lobed, sometimes entire; basal pinnae entire to usually with 1, rarely 2, large, basal, basiscopic lobes, not connected to the pair above by an alate rachis; proliferous buds rarely present, usually absent. **Veins** fully anastomosing, except for included free veinlets. **Leaf-tissue** glabrous above and beneath. **Sori** usually indusiate, with a sinus, rarely a few peltate, in 3–6 series between costules from the costa toward the margin, or well beyond the costa, in regular or often irregular lines. **Indusium** glabrous, rarely some very small indusia present.

In dense forests, primary forests, somewhat open or shrubby woods, often on hillsides or in ravines, 100–1500 m, Amazonas south to Cuzco.

Colombia south to Peru.
This species differs from the next, *Tectaria draconoptera*, in not having the rachis alate to the basal pair of pinnae, and from *Tectaria incisa* in having three to six, usually four or five, series of sori between adjacent costules.

Tectaria sodiroi has been commonly applied to this species, and we have annotated sheets with this name. However, Dr. Robbin Moran has pointed out to us that the holotype (seen by him at K) consists of a part of a stem with lomariopsid vascular pattern and an attached sterile leaf of *Bolbitis nicotianifolia* (Sw.) Alston. There is also a fertile pinna of *Tectaria sodiroi*. Since the fertile pinna provides an inadequate holotype, the name *Tectaria sodiroi* is rejected.

Amazonas: Prov. Bagua, below Montenegro, 18 km E of Olmos, *Hutchison & Wright 3649* (GH, MO, UC, US). Prov. Bagua, Montenegro-Chiriaco, *Sagástegui 5922* (GH). **San Martín:** Zepelacio, near Moyobamba, *Klug 3666* (GH, MO, US). **Loreto:** Santa Rosa, below Yurimaguas, *Killip & Smith 28985* (US). Prov. Maynas, Yanomono, *Vásquez & Jaramillo 4100* (MO). **Huánuco:** Prov. Leoncio Prado, E de Tingo María, *J. Schunke V. 10169* (F, MO, UC). Prov. Huánuco, Dist. Churubamba, *Mexia 8217* (BM, F, GH, MO, UC, US). Tingo María (as San Martín), *Allard 21564, 21565* (US). **Pasco:** Prov. Oxapampa, Río Alto Iscozacín, *Foster & d'Achille 10062* (F). **Cuzco:** Prov. Paucartambo, Atalaya, *Foster et al. 3074* (GH). Prov. La Convención, Río Mapitunuari, *Dudley 11428* (GH, MO).

5. *Tectaria draconoptera* (D. C. Eaton) Copel., Philipp. J. Sci. 2 C: 410. 1907.

Aspidium draconopterum D. C. Eaton, Mem. Amer. Acad. Arts n.s. 8: 211. 1860. TYPE: "Turbo in sinu Urabá, Novae Granadae" (Colombia), A. Schott 19 (not located).

Stem ascending to erect. **Leaves** ca. 80 cm to 1.5 m long. **Lamina** deeply pinnatisect, the large pinna-segments all connected by the broadly to narrowly alate rachis; basal pinna-segments entire or with 1 large, basal, basiscopic lobe; lateral pinna-lobes entire; proliferous buds absent. **Veins** fully anastomosing, except for included free veinlets. **Leaf-tissue** glabrous above and beneath. **Sori** exindusiate, in 4–7 series between costules from the costa to near the margin, the series in regular or mostly irregular lines.

In primary forests and in forested ravines, 350–700 m, Amazonas south to Cuzco and Madre de Dios.

Central America; Colombia, Ecuador, and Peru.

Tectaria draconoptera is a distinctive species, with very many small, exindusiate sori, and with the basal pinnae connected to the pair above by the alate rachis.

Amazonas: Valley of Río Marañón, above Cascadas de Mayasi, *Wurdack* 1862 (us). **Loreto:** Veradero de Mazán, Río Amazonas to Río Napo, *Croat* 19530 (F, MO). **Huánuco:** Prov. Leoncio Prado, E of Tingo María, *J. Schunke* V. 10171 (F, MO, US). **Pasco:** Prov. Oxapampa, Paujil, *León* 296 (usm). **Junin:** 2 km S of Satipo, *Solomon* 3274 (MO, UC). **Ucayali:** Vicinity of Aguaytía (as Loreto), *Croat* 20919 (MO). **Cuzco:** Prov. Paucartambo, Hacienda Villa Carmen, *Vargas* 14682 (GH). Prov. Paucartambo, Cosñipata, *Vargas* 15779 (GH). Río Alto, Urubamba, *Bües* 1760 (us). **Madre de Dios:** Parque Nacional del Manú, *Foster & Terborgh* 6549 (F).

6. *Tectaria plantaginea* (Jacq.) Maxon, Contr. U.S. Natl. Herb. 10: 494. 1908.

Polypodium plantagineum Jacq., Collectanea 2: 104, t. 3, f. 1. 1788. TYPE: Martinique, probably *Jacquin* (holotype, probably w or BM, not seen). The illustration is definitive.

Stem short-creeping. **Leaves** ca. 20–60 cm long. **Lamina** entire, long-decurrent at the base; a proliferous bud present at the apex of the lamina. **Veins** fully anastomosing, except for included free veinlets. **Leaf-tissue** glabrous above and beneath. **Sori** exindusiate or rarely indusiate, in 2 series between the costules, or in 3 or 4 series from the costa to the margin, the lines regular when in 2

series, often irregular and only near the costa when in 3 or 4 series.

In ravines and on stream banks in primary wet forests, 350–750 m, San Martín, and Loreto, south to Huánuco and Madre de Dios.

Central America and West Indies, south to Peru and Brazil.

This is a very distinctive species with an entire lamina that is long-decurrent at its base and with an apical bud. The species is usually exindusiate, but in the Guianas *T. plantaginea* var. *macrocarpa* (Fée) Morton is indusiate. *Tectaria plantaginea* var. *confluens* Morton, with especially the lower sori confluent and the sporangia on an elongate receptacle, seems of sporadic occurrence and not a taxon.

San Martín: Prov. Mariscal Cáceres, Palo Blanco, above Río Tocache, *Plowman & Schunke* 7451 (F). Prov. Mariscal Cáceres, Nuevo Progreso, *J. Schunke* V. 3135 (F, GH, US). Prov. Mariscal Cáceres, Santa Rosa de Mishollo, *J. Schunke* V. 6813 (F, US). **Loreto:** Balsapuerto, *Killip & Smith* 28535 (F, GH, US). **Huánuco:** Tingo María (as San Martín), *Allard* 20884, 20887, 20894, 21550 (us). **Madre de Dios:** Prov. Manú, Casa Erika, Río alto Madre de Dios, *Foster & Baldeón* 12887 (F).

Comments

Two species have been excluded from the Peruvian *Tectaria* flora.

Tectaria heracleifolia (Willd.) Underw., Bull. Torrey Bot. Club 33: 200. 1906.

Aspidium heracleifolium Willd., Sp. pl. ed. 4, 5: 217. 1810. LECTOTYPE (designated by Underw., Bull. Torrey Bot. Club 33: 200. 1906): Hispaniola, Plumier, Traité foug. Amér. t. 147. 1705.

This species occurs in southern Florida, the West Indies, Mexico and Central America, and northern South America. It evidently does not occur in Peru. It has a centrally attached, peltate indusium and in this character differs from other species in America. While a few Peruvian collections have some peltate indusia, some to most of the indusia have a sinus and the specimens are referred to other species.

Tectaria trifoliata (L.) Cav., Descr. pl. 249. 1802.

Polypodium trifoliatum L., Sp. pl. 1087. 1753. LECTOTYPE (designated by Underw., Bull. Torrey

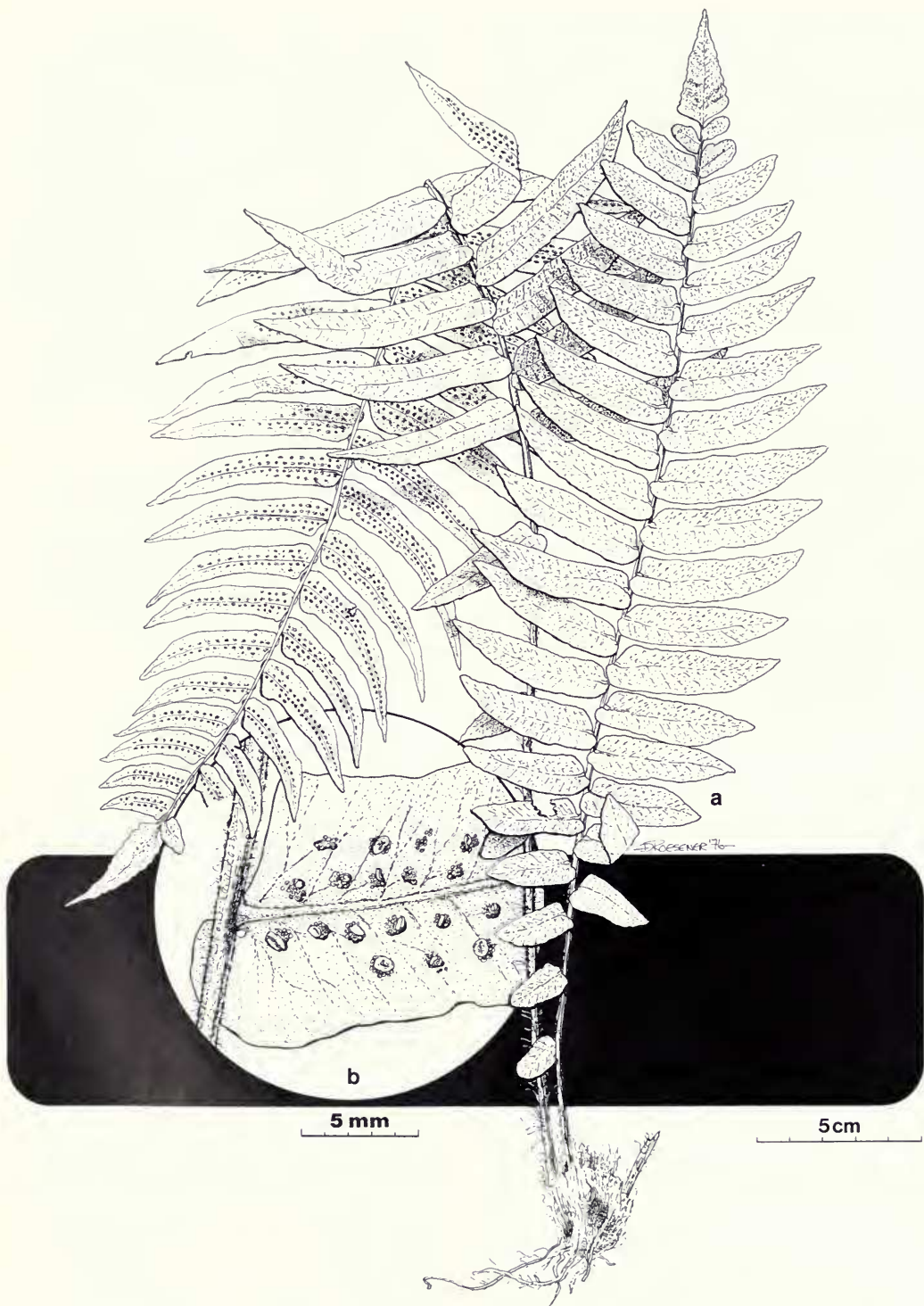


FIG. 5. *Cyclopetis semicordata*: a, habit; b, pinna base, abaxial side. (From Stolze, Ferns & fern allies of Guatemala, 1981.)

Bot. Club 33: 199. 1906): Martinique, Plumier, *Traité foug. Amér. t. 148. 1705.*

This species occurs in the West Indies, and in Surinam, Venezuela, and northern Brazil. The indusia have a sinus and the sori are in several series between costules. It differs from *Tectaria antioquiiana*, to which materials may key out, in having the lamina only lobed, or if pinnate then the terminal stalked segment is abrupt at the base rather than strongly decurrent.

Two names of uncertain application are based on Peruvian collections. While they both probably represent *Tectaria antioquiiana*, accurate identification depends on a study of authentic materials:

Tectaria kunzei (Hieron.) C. Chr., Index fil. suppl. 3: 181. 1934. is based on *Aspidium kunzei* Hieron., Hedwigia 46: 353, 15 July, 1907., which in turn is based on *Aspidium macrophyllum* var. *decurrens* Kunze (not *Tectaria decurrens* (Presl) Copel., 6 Nov. 1907). *Aspidium macrophyllum* var. *decurrens* Kunze, Linnaea 9: 89. 1834 is based on two collections of Poeppig: *Diar. 1138* from Pampayaco, and *Diar. 2288* from Prov. Maynas. The latter is evidently the type collection, because *Diar. 1138* was segregated as a distinct species by Presl in 1851, leaving *Diar. 2288* to represent var. *decurrens*.

Tectaria poeppigii (Presl) C. Chr., Index fil. suppl. 3: 183. 1934, is based on *Aspidium poeppigii* Presl, Epim. Bot. 62. 1851. Presl cites only Pampayaco, Poeppig, which, from the locality, must be *Poeppig 1138*.

V. Cyclopeltis

Cyclopeltis John Sm., Companion, Bot. Mag. 72, III, 2: 36 (first of two pages). 1846. TYPE: *Cyclopeltis semicordata* (Sw.) John Sm. (*Polypodium semicordatum* Sw.). **Figure 5a–b.**

Stem decumbent, rather stout, short-creeping, bearing scales. **Leaves** ca. 20 cm to 1.5 m long, petiole continuous. **Lamina** 1-pinnate, the pinnae entire or nearly so, nearly glabrous to somewhat scaly and pubescent, monomorphic, pinnae articulate, adaxial side of the costa raised. **Veins** free or slightly anastomosing. **Sori** roundish, on the veins in 1–3 series on each side of the costa, not paraphysate, covered by fugacious to persistent, peltate indusia. **Spores** spheroidal, monolet, with prominent folds, more or less spinulose.

Cyclopeltis is a tropical genus of four to six species, with one of them in American and in Peru.

1. **Cyclopeltis semicordata** (Sw.) John Sm., Companion Bot. Mag. vol. 72, III, 2: 36 (first of two pages). 1846. **Figure 5a–b.**

Polypodium semicordatum Sw., Prodr. 132. 1788. TYPE: Jamaica, Swartz (not seen); "Jamaica, ex Vahl" B!, *Herb. Willd.* 19742, photo GH is doubtless authentic.

Stem short-creeping, the apex densely scaly with soft, long, linear, brown scales. **Leaves** mostly 50 cm to 1 m long, the petiole more or less persistently scaly especially toward the base. **Lamina** 1-pinnate, usually with a conform apical segment, pinnae entire or rarely slightly lobed, sessile or nearly so, auriculate at the base of the basiscopic side, the large auricle overlapping the rachis, articulate to the rachis and deciduous with age. **Veins** free or slightly anastomosing. **Sori** borne in 2 series (rarely 1 or 3) on each side of the costa, indusium peltate.

Primary forests, hillside forests, thickets, partly disturbed forests, and river banks, 100–750 m, mostly 400 m or lower, Amazonas to Madre de Dios.

Southern Mexico and the Greater Antilles, south to Bolivia and the Amazon Basin of Brazil.

This is a very distinctive species, with a 1-pinnate lamina, articulate pinnae with a large basal, basiscopic auricle, and peltate indusia. The veins are usually free but sometimes they are casually anastomosing.

Amazonas: Prov. Bagua, 3–5 km above mouth of Río Santiago, *Wurdack 2180* (F, GH, US). E of Huampami, Río Cenepa, *Berlin 301* (MO). **San Martín:** Prov. Mariscal Cáceres, Dist. Campanilla, Mashuyaca, *J. Schunke V. 4218* (F, GH, MO, US). Juan Jui, *Klug 4166* (MO). **Loreto:** Gamitanacocha, Río Mazán, *C. Schunke 194* (F, GH, UC, US). Mouth of Río Santiago, above Pongo de Manseriche, *Mexia 6112* (F, GH, MO, UC, US). **Huánuco:** Prov. Pachitea, Bosque Nacional de Iparia, *J. Schunke V. 1247* (F, GH, US). Prov. Huánuco, Tulumayo, cerca a Tingo María, *Ferreya 2174* (GH, USM). Prov. Tingo María, *Aldave & Fernández 5603* (HUT). **Pasco:** Quillasú, *Soukup 3328* (F, GH). **Junín:** Prov. Tarma, La Merced, *Cerrate 2828* (F, GH). **Ucayali:** Prov. Coronel Portillo (as Loreto), Bosque Nacional de Iparia, *J. Schunke V. 2673* (F, GH, US). Prov. Coronel Portillo, Bosque von Humboldt, *Young & Salazar 1017* (MO). **Ayacucho:** Near Kimpitiriki, Río Apurímac, *Killip & Smith 22881* (GH, US). **Madre de Dios:** Parque Nacional de Manú, Cocha Casha, *Foster*

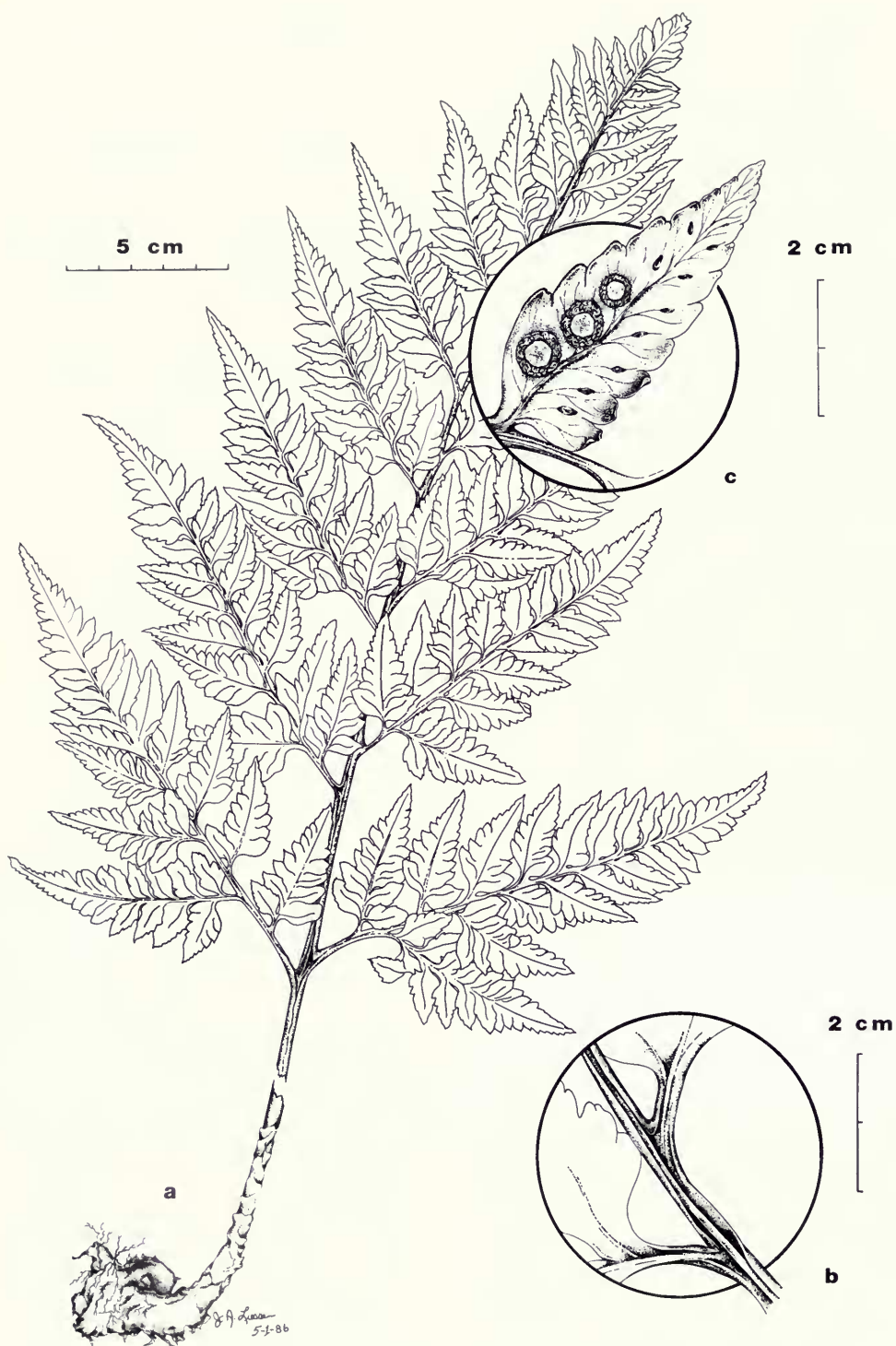


FIG. 6. *Rumohra adiantiformis*: a, habit; b, portion of rachis with bases of costae, adaxial side; c, pinnule, abaxial side. (From Anderson et al. 35820, Brazil, F.)

& Terborgh 6636, 6665 (F). Prov. Tambopata, Río Madre de Dios, Alfaro 1851 (MO).

VI. *Rumohra*

Rumohra Raddi, Opusc. Sci. 3: 290. 1819. TYPE: *Rumohra aspidioides* Raddi = *Rumohra adiantiformis* (Forster) Ching. Figure 6a–c.

Stem rather stout, long-creeping, bearing scales. **Leaves** ca. 10 cm to 1 m long, petiole continuous. **Lamina** 2-pinnate-pinnatifid to 4-pinnate, glabrous or somewhat scaly, monomorphic, adaxial side of the rachis with a central ridge and glabrous grooves on each side, pinnae not articulate. *Pinna-rachis* sulcate on the adaxial side, the groove continuous with that of the rachis. **Veins** free. **Sori** roundish, on the veins or at the vein tips, not paraphysate, covered by peltate indusia that, with the slender central stalk, is often fugacious. **Spores** rather ellipsoidal, monolete, with short to long ridges, or saccate.

Rumohra is a small genus consisting of the widely spread *R. adiantiformis* and a few other species. In America there is the former species and *R. berteriana* (Colla) Duek & Rodríguez of the Juan Fernandez Islands.

1. *Rumohra adiantiformis* (Forster) Ching, Sinen-sia 5: 70. 1934. Figure 6a–c.

Polypodium adiantiforme Forster, Prodr. 82. 1786. TYPE: "Ins. austral." *G. Forster* (holotype or isotype, BM, GOET).

Stem long-creeping, the leaves spaced, densely covered with brown, broad, thin scales. **Leaves** to ca. 1 m long, the petiole usually scaly, especially toward the base. **Lamina** 2-pinnate-pinnatifid to 4-pinnate, glabrous or somewhat scaly, coriaceous, the basal pinnae the largest. **Sori** roundish, indusium peltate, often fugacious.

On rocks near river, ca. 2400 m, Amazonas. Bermuda, south to southern Chile and the Falkland Islands; Old World. *Rumohra adiantiformis* is uncommon in the Andes. It is distinguished from species of other

genera by the peltate indusia, stalked pinnae, and the entire to obtusely dentate ultimate segments. If the indusia are absent, the adaxial side of the rachis, with a central ridge and a groove on each side, is distinctive. The adaxial side of the penultimate segments has the costa prominently raised, rather than flattened or grooved as in *Dryopteris*.

Amazonas: Prov. Chachapoyas, Río Ventilla, 1–2 km W of Molinopampa, Wurdack 1472 (GH, US).

VII. *Lastreopsis*

Lastreopsis Ching, Bull. Fan Mem. Instit. Biol., Bot. 8: 157. 1938. TYPE: *Lastreopsis recedens* (Moore) Ching (*Lastrea recedens* Moore) = *Lastreopsis tenera* (R. Br.) Tindale. Figure 7a–b.

Stem erect to short- or long-creeping, usually moderately stout, bearing scales. **Leaves** ca. 50 cm to 2 m or rarely 3 m long, petiole continuous. **Lamina** 2-pinnate to 5-pinnate-pinnatifid, pubescent, glandular-pubescent, glandular, and often scaly, monomorphic, adaxial side of the rachis with a ridge on each side of a pubescent groove, pinnae not articulate, the pinna-rachis sulcate adaxially, the groove continuous with that of the rachis. **Veins** free. **Sori** roundish, borne on the veins or on the vein tips, not paraphysate, covered by reniform, rarely subpeltate indusia or exindusiate. **Spores** rather ellipsoidal, monolete, strongly ridged, or saccate.

Lastreopsis is a genus of about 35 species, with five in America and two in Peru. It is pantropical and south temperate in its distribution. It is readily separated from *Dryopteris*, *Stigmatopteris*, and *Cyclodium* by the raised costa on the adaxial side. Those other genera, which may have some species that resemble some of *Lastreopsis*, all have the costa grooved on the adaxial side.

Reference

TINDALE, M. D. 1965. A monograph of the genus *Lastreopsis* Ching. Contr. N.S.W. Natl. Herb., 3: 249–339.



FIG. 7. *Lastreopsis effusa* ssp. *divergens*: a, portion of lamina. *Lastreopsis killipii*: b, portion of rachis and pinna base, adaxial side; c, tertiary segment, abaxial side. (a from R. Williams 1273, Bolivia, GH; b, c from Little 9401, Colombia, F.)

Key to Species of *Lastreopsis*

- a. Lamina catadromic, at least above the basal pinnae; sori exindusiate; rachis glabrous or nearly so 1. *L. effusa*
- a. Lamina anadromic throughout; sori indusiate; rachis prominently scaly 2. *L. killipii*

1. *Lastreopsis effusa* (Sw.) Tindale, Vict. Nat. 73: 184. 1957. **Figure 7a.**

Polypodium effusum Sw., Prodr. 134. 1788. LECTOTYPE (designated by Tindale, 1957): Jamaica, Swartz (holotype, B!, Herb. Willd. 19724; photo GH; isotypes, C, UPS).

Stem decumbent, short-creeping, to nearly erect, bearing brown, lanceolate scales. **Leaves** ca. 1–2.5 m long; the petiole glabrous, or slightly scaly, especially toward the base. **Lamina** 3-pinnate to 4-pinnate-pinnatifid, catadromic, at least above the basal pinnae, the apex gradually reduced, usually somewhat pubescent and/or glandular, especially on the adaxial side of the axes; usually bearing a proliferous bud toward the apex of the rachis; pinnae stalked, the basal the largest. **Veins** free. **Sori** borne on the veins, exindusiate.

Dense forests, disturbed forests, and on mountain slopes, 135–1800 m, Cajamarca to Cuzco and Madre de Dios.

Tropical America.

Of the four more or less sympatric subspecies recognized by Tindale (1957), only ssp. *divergens* (Willd.) Tindale is in Peru. *Lastreopsis effusa* is one of the few species of the genus that has the lamina usually with a scaly bud toward the apex of the rachis.

Cajamarca: Prov. Hualgayoc, Soukup 3812 (F, US). Prov. Santa Cruz, Sagástegui et al. 12391 (F, GH, HUT). **Loreto:** Prov. Maynas, Río Nanay, across from Bellavista, McDaniel & Rimachi 18794 (GH, MO). Santa Rosa, below Yurimaguas, Killip & Smith 28733, 28853 (US). **Huánuco:** Pampayacu, Río Chinchao, Macbride 5036 (F, US). **Pasco:** Prov. Oxapampa, Valle del Palcazú, León 679 (F). **Junin:** Above San Ramón, C. Schunke A226 (US). Chanchamayo Valley, C. Schunke 50, 90 (F, US). Prov. Satipo, León 186 (MO, USM). **Cuzco:** Prov. La Convención, Río Apurímac, Davis et al. 1310 (F). **Madre de Dios:** Prov. Manú, Cocha Cashu uplands, Núñez 5815 (MO).

2. *Lastreopsis killipii* (Maxon) Tindale, Vict. Nat. 73: 185. 1957. **Figure 7b–c.**

Dryopteris killipii Maxon, Amer. Fern J. 18: 4. 1928. TYPE: Panama, Chiriquí, W of El Boquete, Killip 5360 (holotype, US; isotype, GH!).

Stem short-creeping, decumbent, bearing brown, narrow scales. **Leaves** ca. 2–5 m long; the petiole rather persistently scaly, with mostly brownish, narrow scales. **Lamina** 4-pinnate to nearly 5-pinnate, anadromic, the apex gradually reduced, variously scaly, pubescent, and/or glandular, especially on the axes; lacking a proliferous bud; pinnae stalked, the basal the largest. **Veins** free. **Sori** borne on the veins, covered by a reniform, persistent indusium.

Dense forests and cloud forests, 2080–2700 m, Cuzco.

Costa Rica, Panama, Colombia, and Peru.

The leaves are up to 3.5 or even 5 m long.

Cuzco: Prov. La Convención, altura de Pintobamba, Vargas 3552 (US). Prov. La Convención, Cordillera Vilcabamba, Dudley 11243 (GH, US).

Comments

Except for the widespread *Lastreopsis effusa*, other species of South America are not commonly collected, but two of them may be found in Peru.

- Lastreopsis amplissima* (Presl) Tindale, Vict. Nat. 73: 185. 1957.

Polystichum amplissimum Presl, Epim. Bot. 58. 1851. SYNTYPES: Brazil, Sellow; Brazil, Serra d'Estrella, Beyrich (neither located); ISOSYNTYPE: Sellow (B).

This species has a wholly anadromic lamina with indusiate sori and is closely related to *L. killipii*. It has the ultimate segments mostly sharply pointed to mucronate apically, while *L. killipii* has them mostly obtuse to subacute. This species ranges from Venezuela south to southeastern Brazil and Par-

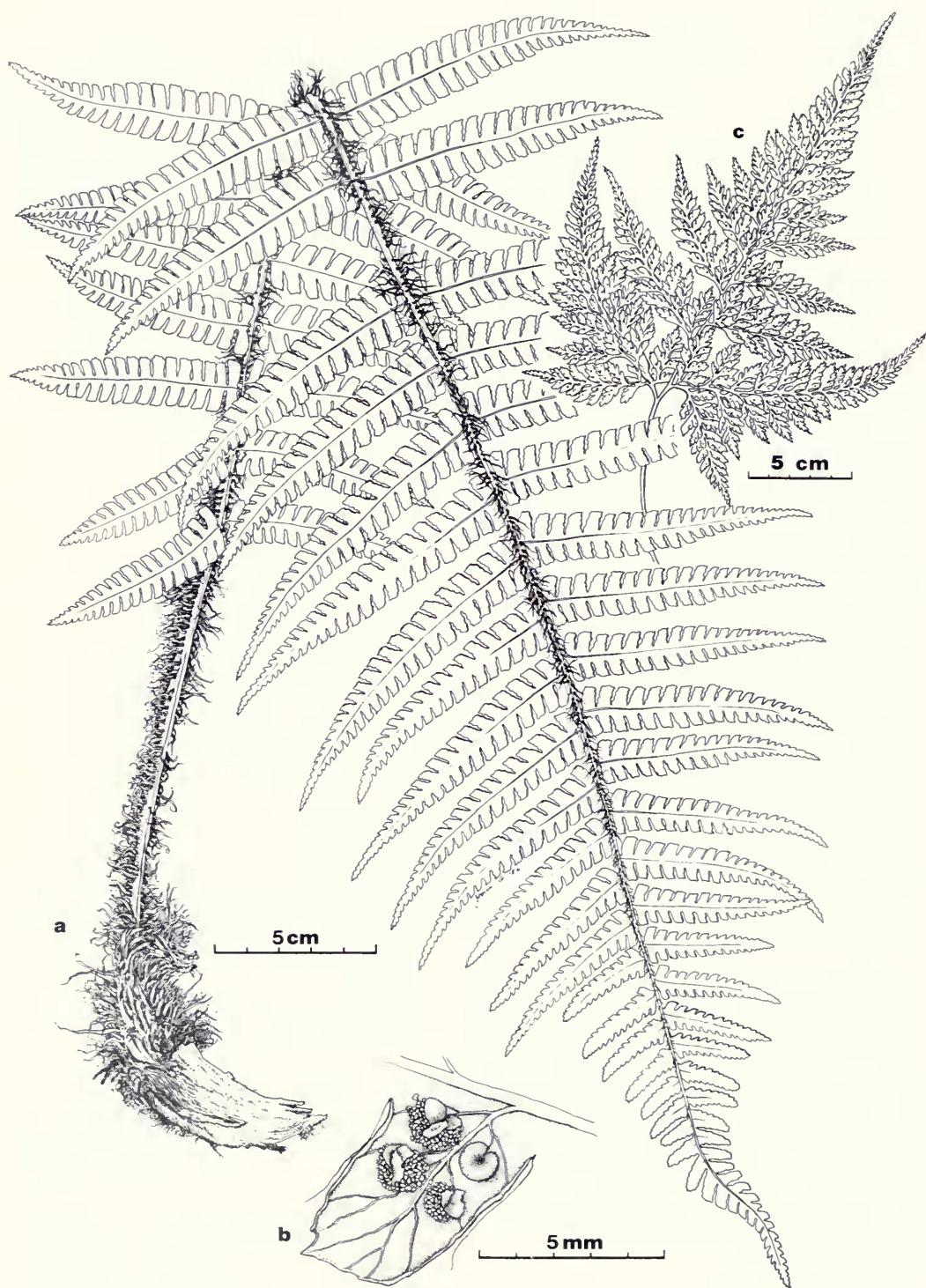


FIG. 8. *Dryopteris paleacea*: a, habit; b, pinna segment, abaxial side; *Dryopteris denticulata*: c, lamina. (a, b from Killip & Smith 18824, Colombia, F; c adapted from Stolze. Ferns & fern allies of Guatemala, 1981.)

aguay; it is also in Bolivia and may be expected to grow in southern Peru.

Lastreopsis exulta (Mett.) Tindale, Vict. Nat. 73: 185. 1957.

Aspidium exultum Mett., Über einige Farngatt. IV. Phegopt. Aspid. 69, t. 17, f. 9. 1859. (Abh. Senckenberg Naturf. Ges. 2: 353. 1858. TYPE: Venezuela, Caracas, Moritz 433 (holotype, B?; isotype, GH!).

This species has a catadromic lamina, indusia, and a short-pubescent costa adaxially. It grows in Mexico south to northern South America and Ecuador and probably also grows in northern Peru.

VIII. **Dryopteris**

Dryopteris Adans., Fam. plantes 2: 20. 551. 1763, nom. conserv. TYPE: *Dryopteris filix-mas* (L.) Schott (*Polypodium filix-mas* L.). **Figure 8.**

- Arachniodes* Blume, Enum. pl. Javae 241. 1828. TYPE: *Arachniodes aspidioides* Blume = ?*Dryopteris aristata* (Forster) Kuntze.
- Lastrea* subsection ?*polystichopsis* John Sm., Hist. fil. 217. 1875. LECTOTYPE (designated by C. Chr., Index fil. xxi. 1906): *Lastrea pubescens* (Sw.) Presl (*Polypodium pubescens* (L.) = *Dryopteris pubescens* (L.) Kuntze.
- Dryopteris* subgenus *Polystichopsis* (John Sm.) Ch. Chr., Danske Vidensk. Selsk. Skrift. Nat. Math. VII, 6(1): 101. 1920.
- Polystichopsis* (John Sm.) Holtt., Flora Malaya 2 (Ferns Malaya): 484. 1955.
- Byrsopteris* Morton, Amer. Fern J. 50: 149. 1960. TYPE: *Byrsopteris aristata* (Forster) Morton (*Polypodium aristatum* Forster) = *Dryopteris aristata* (Forster) Kuntze.

Stem decumbent, small or stout, or erect to ca. 30 cm tall, rarely long-creeping, bearing scales.

Key to Species of *Dryopteris*

- a. Rachis definitely scaly with long, narrow, dark brown or darker scales, these grading into fibrils; pinnae sessile or nearly so, deeply pinnatifid to usually pinnatisect; secondary segments approximate, nearly entire 1. **D. paleacea**
- a. Rachis with a few scattered scales, or none, long-pubescent, minutely glandular, or glabrous b
 - b. Lamina minutely glandular, especially on the rachis, at the base of the pinnae, on the pinna-rachis, costa, and usually elsewhere c
 - c. Pinnae stalked, or rarely short-stalked, the basal ones not or hardly reduced, usually the largest on the lamina; basal secondary segments on the central pinnae narrowed at the base, or stalked,

Leaves ca. 10 cm to 2 m long, petiole continuous. **Lamina** 1-pinnate, usually 2-pinnate-pinnatifid, to rarely 6-pinnate, glabrous, glandular, pubescent, or scaly, monomorphic or slightly dimorphic, adaxial side of the costa sulcate to nearly flat. **Veins** free. **Sori** roundish, borne on the veins or on the vein tips, not paraphysate, covered by usually reniform, rarely subpeltate, indusia, or exindusiate. **Spores** rather ellipsoidal, monolete, prominently ridged, saccate, or cristate, often spinulose.

Dryopteris is a large genus of about 150 species. It is worldwide in its distribution. The center of species diversity is in China and adjacent regions. There are about 25 species in America, and five in Peru.

Dryopteris sensu stricto is closely allied to the sometimes recognized genera *Arachniodes* and *Polystichopsis*. Some species, usually placed in one of the three groups, are divergent in their characters toward another group. The whole assemblage is closely allied and relations of a number of species are unclear. For these reasons all species are treated here in the single genus *Dryopteris*.

Two subgenera may be recognized: *Dryopteris* subgenus *Dryopteris* has the stem with internal glands, the lamina often catadromic, and the basal pinnae not, or not much, enlarged. Peruvian species are *Dryopteris patula*, *D. paleacea*, and *D. saffordii*. *Dryopteris* subgenus *Polystichopsis* (including *Arachniodes*) has the stem lacking internal glands, the lamina anadromic, and the basal pinnae enlarged. Peruvian species are *Dryopteris denticulata* and *D. ochropteroides*.

Reference

TRYON, R. M., AND A. F. TRYON. 1982. *Dryopteris*, pp. 496–509, in Ferns and allied plants, Springer-Verlag, New York.

usually connected to the next pair of segments by a narrow wing of the pinna-rachis

- 2. **D. patula**
c. Pinnae sessile or nearly so, the basal ones reduced, usually much reduced, shorter than the central pinnae; basal secondary segments on the central pinnae usually joined to the next pair of segments by their decurrent base 3. **D. saffordii**
b. Lamina eglandular, glabrous, or with a few fibrils, or long-pubescent, especially on the axes d
d. Rachis and other axes glabrous or with a few fibrils 4. **D. denticulata**
d. Rachis and other axes long-pubescent, especially on the abaxial side, or partly so
..... 5. **D. ochropteroides**

1. **Dryopteris paleacea** (Sw.) Hand.-Mazz., Verhandl. Zool.-Bot. Gesells. Wein 58: (100). 1908. Figure 8a–b.

Aspidium paleaceum Sw., Syn. fil. 52. 1806. TYPE: Peru, *Lagasca* misit (holotype, s, Herb. Swartz; photos, GH, US).

Aspidium parallelogramma Kunze, Linnaea 13: 146. 1839. SYNTYPES: Mexico, *Hegewisch*, Mexico, *Karwinsky* (not located).

Dryopteris parallelogramma (Kunze) Alston, Amer. Fern J. 47: 92. 1957.

Stem erect, stout. **Leaves** borne in a crown, ca. 30 cm to 1.5 m long. **Lamina** 1-pinnate-pinnatifid to usually 1-pinnate-pinnatisect, more or less scaly, especially on the rachis, which is rather densely scaly, with mostly long, narrow, reddish brown to dark brown or partly blackish scales abaxially and often fibrillose adaxially. **Pinnae** sessile or nearly so, the basal not much shorter than the central ones; the secondary segments approximate, nearly entire to somewhat dentate.

In dense forests or thickets, disturbed forests, in moist ravines, on wet, shaded road banks, and at the base of rocks, 2400–4000 m, Cajamarca to Puno.

Mexico and Greater Antilles, south to Argentina and southern Brazil; primarily montane.

The correct taxonomy of this species is not clear. There may be one, essentially pantropical, species, or there may be two, one American and the other Old World. The American element is here treated as a separate species, pending a definitive resolution of this problem.

The correct nomenclature depends upon the interpretation of the publication of *Aspidium paleaceum* by Don (Prodr. fl. nepal. 4. 1825). If this is a new species (Alston, Amer. Fern J. 47: 91–92. 1957; A. R. Smith and Fraser-Jenkins, Taxon 31: 326–329. 1982) then the correct name for the collective species is *Dryopteris wallichiana* (Sprengel)

Hylander. This is also the correct name for the Old World element, as a species, while the American element is *Dryopteris parallelogramma* (Kunze) Alston.

If Don's name is a later use of *Aspidium paleaceum* Sw. (the conclusion adopted here; also by Fraser-Jenkins, Taxon 29: 610–611. 1980) then the correct name for the collective species is *Dryopteris paleacea* (Sw.) Hand.-Mazz. This is also the correct name for the American element, as a species, while the Old World element is *Dryopteris wallichiana* (Sprengel) Hylander.

Cajamarca: Prov. San Miguel, Vista Alegre, *Llatas Q. 1574* (F). Prov. Celendín, entre Celendín y Cajamarca, *López et al. 4462* (GH, HUT). **Amazonas:** Prov. Chachapoyas, Cerros Calla Calla, *Hutchison & Wright 5753* (F, GH, MO, UC, US). Prov. Chachapoyas, Puma-urcu, SE of Chachapoyas, *Wurdack 559* (F, GH, UC, US). **La Libertad:** Prov. Pataz, above Pampa Rosas, *Young 3105* (F). Prov. Santiago de Chuco, Dist. Cachicadán, *Saunders 884* (F, GH). Between Huamachuco and Cajabamba, *Correll & Smith P925* (GH). **San Martín:** Dist. Huallaga, valley of Río Apisoncho, *Hamilton & Holligan 925* (UC). Prov. Mariscal Cáceres, Río Abiseo National Park, *Young & León 4982* (F). **Huánuco:** Mito, *Macbride & Featherstone 1512* (F, US). Prov. Huánuco, 32 km from Huánuco on Huánuco-La Unión Road, *Smith et al. 2187* (MO). **Junín:** Carpapata, above Huacapistana, *Killip & Smith 24465* (F, US). **Huancavelica:** Entre Huschocolpa y Suncubamba, *Tovar 4237* (GH). **Ayacucho:** Prov. La Mar, *Dudley 9051* (GH). Prov. La Mar, between El Tambo and Ayna, *Plowman & Davis 4684* (GH). **Apurímac:** Dist. Abancay, *Saunders 761* (GH). **Cuzco:** Machu Picchu, *Peyton & Peyton 759* (GH, MO). Prov. La Convención, Dist. Vilcabamba, *Davis et al. 1219* (F, GH). **Puno:** Prov. Carabaya, entre Ayapata y Káhualluyac, *Vargas 10735* (GH).

2. **Dryopteris patula** (Sw.) Underw., Our native ferns, ed. 4, 117. 1893.

Aspidium patulum Sw., Kongl. Vetensk. Acad. Handl. 1817: 64. TYPE: Brazil, Minas Gerais, *Freyreiss* (holotype, s, seen by C. Chr. Monogr. genus *Dryopteris* 1: 19. 1913).

Stem erect or nearly so, rather stout. **Leaves** borne in a cluster, ca. 25 cm to 1 m long. **Lamina** 2-pinnate to 3-pinnate-pinnatifid, minutely glandular, especially on the rachis, at the base of the pinnae, on the pinna-rachis, and often elsewhere, the rachis sometimes with scattered light brown scales. **Pinnae** stalked, rarely short-stalked to nearly sessile, the basal not or hardly reduced, usually the largest, secondary segments usually spaced, usually shallowly to sometimes deeply lobed or more complex.

In woods, among shaded rocks, and on rocky slopes, 2000–2700 m, Huánuco, Junín, and Cuzco.

Mexico and the Greater Antilles, south to Argentina and southern Brazil; primarily montane.

This species has a more complex lamina than *Dryopteris saffordii*. The basal segments of the central pinnae are narrowed at the base, or stalked and connected to the next pair of segments by a narrow wing along the pinna-rachis.

Huánuco: Chinchao to Puente Durand, *Coronado* 82 (US). Muña, *Bryan* 419 (F). Yanano, *Macbride* 3821 (F, US). **Junín:** Carpapata, *Kunkel* 603 (GH). **Cuzco:** Machu Picchu, *León* 453 (F, GH, HUT), *Coronado* 95 (UC, US). Prov. Paucartambo, *Pillawata*, *Vargas* 16688 (GH).

3. *Dryopteris saffordii* C. Chr., Amer. Fern J. 1: 94, 1911. TYPE: Peru, mountains back of Lima, Arroya Railroad, *W. E. Safford* 994 (holotype, US; photo, GH; isotype, US).

Stem usually small, decumbent to erect. **Leaves** borne in a cluster, ca. 15–60 cm long. **Lamina** 1-pinnate-pinnatifid to rarely 2-pinnate-pinnatifid, minutely glandular, especially on the rachis, at the base of the pinnae, on the pinna-rachis, the costa, and often elsewhere, the rachis sometimes with scattered light brown scales. **Pinnae** sessile or nearly so, the basal ones much reduced, secondary segments approximate or spaced, nearly entire to lobed or rarely pinnatifid.

Brushy, rocky slopes, open rocky places, at the base of rocks, 400–4000 m (400–600 m on Loma Lachay, otherwise at 2200–4000 m), Cajamarca to Puno.

Peru and Bolivia.

Dryopteris saffordii is very close to *D. patula* and might better be treated as a subspecies or variety of it. *Soukup* 2961, Huancayo, and *Fiebrig* 3133, in part, Bolivia (GH) have large leaves with

the lamina 2-pinnate-pinnatifid and nearly sessile pinnae, the basal definitely reduced. These collections are rather intermediate between the two species. Apparently intermediate specimens, however, are few and it seems best to maintain two species at the present time.

Cajamarca: Prov. Contumazá, Guzmango, *Sagástegui* 2938 (F, GH). 29 km from Cajamarca on road to Chilite, *Correll & Smith* P849 (GH), P852 (GH, US). Prov. Cajamarca, cumbre El Galván, *Ferreira* 3276 (USM). **La Libertad:** Prov. Otuzco, Huaranchal, *López et al.* 2663 (GH). Between Huamachuco and Cajabamba, *Correll & Smith* P922 (GH). Prov. Sánchez, Carrión, *Sagástegui* 9445 (HUT). **Ancash:** Prov. Bolognesi, E of Huasta, *Cerrate* 2460 (GH, USM). Prov. Bolognesi, arriba de Chiquián, *Cerrate* 1550 (GH). **Lima:** Prov. Chancay, Loma de Lachay (as Luchay), *Tryon & Tryon* 5417 (F, GH, US), *Coronado* 22 (GH, UC, US). Prov. Huarochiri, Dist. Surco, *Saunders* 657 (F, GH, US). **Junín:** Huancayo, *Soukup* 2961 (F, GH, MO, US). **Cuzco:** Prov. Urubamba, Chupani, *Vargas* 11125 (GH). **Puno:** Near Puno, *Soukup* 92 (F).

4. *Dryopteris denticulata* (Sw.) Kuntze, Revis. gen. pl. 2: 812. 1891. **Figure 8c.**

Polypodium denticulatum Sw., Prodr. 134. 1788. TYPE: Jamaica, *Swartz* (holotype, s, seen by C. Chr., Monogr. genus *Dryopteris* 2: 113. 1920). *Arachniodes denticulata* (Sw.) Ching, Acta Bot. Sinica 10: 260. 1962.

Stem decumbent to erect, small to rather stout. **Leaves** borne in a cluster, ca. 25 cm to 1 m long. **Lamina** 3-pinnate-pinnatifid to 4-pinnate-pinnatifid, or 5-pinnate, glabrous or glabrate. **Pinnae** stalked, the basal ones enlarged, the longest, secondary segments 1-pinnate or more complex.

Moist forests, and roadside banks, 2000–3000 m, Cajamarca, south to Puno.

Southern Mexico and the Greater Antilles, south to northern South America and Bolivia; southeastern Brazil.

The lamina is very strongly and wholly anadromic, and the ultimate segments are mostly sharply dentate, especially the apical ones.

Cajamarca: Prov. Cutervo, Llipa, *Mostacero et al.* 1749 (F, HUT). **Amazonas:** Prov. Chachapoyas, 5 km below Chachapoyas, *Wurdack* 778 (F, GH), 779 (F, USM). **San Martín:** *León* 2144, 2162 (F). Prov. Bongará, El Ingenio-Pomacochas, *Sagástegui* 5968 (GH). **Huánuco:** Cushi, *Bryan* 685 (F). **Pasco:** Prov. Oxapampa, Río San Alberto valley, E of Oxapampa, *Smith & Pretel* 7598 (F). **Puno:** Sandia, *Vargas* 11859 (GH).

5. *Dryopteris ochropteroides* (Baker) C. Chr., Index fil. 280. 1905.

Nephrodium ochropteroides Baker, Ann. Bot. (London) 5: 325. 1891. TYPE: Jamaica, Fox's Gap, Hart (holotype, κ ; isotype, υ).

Polystichopsis ochropteroides (Baker) Morton, Amer. Fern J. 50: 155. 1960.

Arachniodes ochropteroides (Baker) Lell., Amer. Fern J. 77: 101. 1988.

Stem rather slender and long-creeping in small plants, becoming rather stout and decumbent. **Leaves** clustered to spaced, ca. 40 cm to 1 m long. **Lamina** 3-pinnate to 4-pinnate-pinnatifid, with the axes long-pubescent, especially on the abaxial side, usually densely so but sometimes the pubescence scattered. **Pinnæ** stalked, the basal ones enlarged and the longest, secondary segments 1-pinnate or more complex.

Dense cloud forests, ca. 1290 m, Huánuco; a single collection from Peru.

Jamaica, Surinam, Venezuela, and Peru; range uncertain.

The lamina is definitely anadromic and the ultimate segment are subacute to acute.

This species is separated from the similar *Dryopteris macrostegia* (Hooker) O. Kuntze, of Venezuela, Colombia, and northern Brazil, by the axes of the lamina that are long-pubescent. The latter species has the axes of the lamina glabrous. The pubescence of *Dryopteris ochropteroides* may be scattered and sparse. Both species are seldom collected and additional material is needed in order to understand their relation.

Huánuco: Río Llullapichis watershed, ascent of Cerros del Sira, Dudley 13062 (GH, US).

IX. *Cyrtomium*

Cyrtomium Presl, Tent. pterid. 86. 1836. TYPE: *Cyrtomium falcatum* (L. f.) Presl (*Polypodium falcatum* L. f.). **Figure 9.**

Phanerophlebia Presl, Tent. pterid. 84. 1836, cited as a synonym of *Cyrtomium* by Moore, Index fil. lxxxii. 1857. TYPE: *Phanerophlebia nobilis* (Schlect. & Cham.) Presl (*Aspidium nobile* Schlect. & Cham.) = *Cyrtomium nobile* (Schlect. & Cham.) Moore.

Stem decumbent, short, rather stout, to nearly erect, bearing scales. **Leaves** ca. 15 cm to 1.5 m

long, petiole continuous. **Lamina** 1-pinnate, or rarely entire, or 2-pinnate, glabrate to more or less scaly, monomorphic, adaxial side of the costa sulcate, pinnæ not articulate, more or less inequilateral at the base. **Veins** free to regularly anastomosing and with or without included free veinlets. **Sori** roundish, borne on the veins or at the vein tips, in 2 to several (rarely 1) series on each side of the costa, not paraphysate, covered by persistent to fugacious, peltate indusia or rarely exindusiate. **Spores** ellipsoidal to spheroidal, monolet, ridged, rugose or saccate.

Cyrtomium is a genus of about 25 species, most of them in eastern Asia. In America the nine or ten species are concentrated in Mexico and Central America. A single native species, *C. dubium*, occurs in Peru.

Although the predominantly free-veined American species are sometimes recognized as a distinct genus *Phanerophlebia*, the two groups are not wholly distinctive.

References

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MAXON, W. R. 1912. Notes on the North American species of *Phanerophlebia*. Bull. Torrey Bot. Club, 39: 23–28.
UNDERWOOD, L. M. 1899. American ferns, II. The genus *Phanerophlebia*. Bull. Torrey Bot. Club, 26: 205–216.

1. *Cyrtomium dubium* (Karsten) R. & A. Tryon, Rhodora 83: 134. 1981. **Figure 9a–b.**

Phegopteris dubia Karsten, Fl. columb. 1: 169, t. 84. 1861. TYPE: Colombia, Bogotá, Tequendama, Karsten (not located).

Phegopteris dictyophylla Kuhn, Linnaea 36: 106. 1869. TYPE: Ecuador, Spruce 5263 (holotype, β ?; isotype, as Spruce 5265, ρ , Herb. Bonaparte. Not Spruce 5263, ρ , Herb. Bonaparte which is *Polystichum Bonapartii* Rosenst.; holotype, ρ , Herb. Bonaparte; isotype, GH!).

Polystichum dubium (Karsten) Diels, Nat. Pflanzenfam. 1(4): 194. 1899.

Stem decumbent, very short-creeping, to erect, bearing dark brown, lustrous scales. **Leaves** ca. 30 cm to 1 m long, the petiole usually sparingly scaly. **Lamina** usually 1-pinnate, to rarely partly or fully



FIG. 9. *Cyrtomium dubium*: a, habit; b, portion of pinna, abaxial side. (a from Peyton & Peyton 1275, GH; b from Killip & Smith 20366, GH.)

2-pinnate, the apex gradually reduced, pinnae usually entire or nearly so, herbaceous, usually rather sharply dentate, often with a usually prominent basal auricle on the acroscopic side, veins mostly free to freely anastomosing, with or without included free veinlets. **Sori** in usually 3 (2 to 4) series on each side of the costa or costule, exindusiate.

Dense hillside forests, scrubby forests, sometimes among rocks, or rarely a low epiphyte, 1450–3400 m, Cajamarca to Cuzco.

Costa Rica south to Bolivia.

Cyrtomium dubium is a morphologically rather isolated species that is not clearly placed in either *Polystichum* or *Cyrtomium*. It has, however, the usually anastomosing veins and multiseriate sori of the latter genus and seems best placed there.

It is a variable species in lamina architecture and venation. *Spruce 5263* is evidently a mixed collection of 2 species and *Spruce 5265* is a mixture of 1-pinnate and 2-pinnate *Cyrtomium dubium*.

The pinnae vary from usually entire with an obtuse to acuminate apex, to more or less serrately lobed, or the pinnae may be basally mostly 1-pinnate or fully 1-pinnate, as in *Barbour 2875*. The venation varies from fully anastomosing, except at the margins, to mostly free. Although some of this variation may be related to hybridization, especially with species of *Polystichum*, spores appear to be normal and the lamina architecture is regular. The 1-pinnate and 2-pinnate lamina forms are therefore considered to be within the normal range of variation of the species, as in various species of *Lindsaea*.

Cajamarca: Prov. Cutervo, San Andrés, *López & Sagástegui 5401* (GH, HUT). **Amazonas:** E of La Peca, *Barbour 2875* (MO). **San Martín:** Between Mirador and La Playa, *Young & León 4927* (F, USM). **Huánuco:** Muña, *Bryan 554* (F, US). Huacachi, near Muña, *Macbride 4126* (F, US). **Junín:** Carpapata, above Huacapistana, *Killip & Smith 24464* (BM, F, US). **Ayacucho:** Between Huanta and Río Apurímac, *Killip & Smith 22362* (US). **Cuzco:** Urubamba, Machu Picchu, *Peyton & Peyton 1328* (GH, MO), *1504* (MO). Quillabamba, Santa Teresa, *Peyton & Peyton 1275* (GH, MO). Prov. Paucartambo, Pillahuata, *Aldave 5021* (HUT).

Comments

Cyrtomium falcatum (L. f.) Presl, Tent. pterid. 86. 1836.

Polypodium falcatum L. f., Suppl. pl. syst. veg. ed. 13, 446. 1782. TYPE: Japan, Nagasaki, *Thunberg* (holotype, LINN?; isotype, UPS).

This is a commonly cultivated species of eastern Asia. It has been collected on the sea-cliffs near Lima and it may be adventive elsewhere in Peru. It differs from *Cyrtomium dubium* in being indusiate, and having very coriaceous pinnae with thickened margins.

Lima: Prov. Lima, Magdalena del Mar, cerca a Lima, Julio 14, 1942, *Zuñiga* (GH).

X. Didymochlaena

Didymochlaena Desv., Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk. 5: 303. 1811. TYPE: *Didymochlaena sinuosa* Desv. = *Didymochlaena truncatula* (Sw.) John Sm. **Figure 10a–c.**

Stem decumbent or usually erect, rather stout, bearing scales. **Leaves** ca. 75 cm to 2 m or rarely 3 m long, petiole continuous. **Lamina** 2-pinnate, nearly glabrous to scaly and pubescent, monomorphic, pinnules dimidiate. **Veins** free. **Sori** elongate, borne on the veins, not paraphysate, covered by elongate indusia on each side of a vein. **Spores** ellipsoidal to spheroidal, monolete, with short ridges or saccate, spinulose.

Didymochlaena is a monotypic genus of pan-tropical distribution. The single species is variable, especially in its lamina architecture.

1. *Didymochlaena truncatula* (Sw.) John Sm., J. Bot. (Hooker) 4: 196. 1841. **Figure 10a–c.**

Adiantum lunulatum Houtt., Nat. Hist. 2, 14: 209. *t.* 100, *f.* 1. 1783, not Burm. 1768. TYPE: uncertain, the figure may serve for identification.

Aspidium truncatulum Sw., J. Bot. (Schrader) 1800(2): 36. 1802, *nom. nov.* for *Adiantum lunulatum* Houtt., and with the same type.

Didymochlaena lunulata Desv., Mém. Soc. Linn. Paris 6: 282. 1827, *nom. superfl.* for *Aspidium truncatulum* Sw., and with the same type.

Stem stout, bearing dense, linear, brown scales. **Leaves** to 2 m or rarely 3 m long, the petiole moderately scaly to usually densely so toward the base. **Lamina** 2-pinnate, the ultimate segments (pinnules) short-stalked, dimidiate, entire, obtuse, gla-

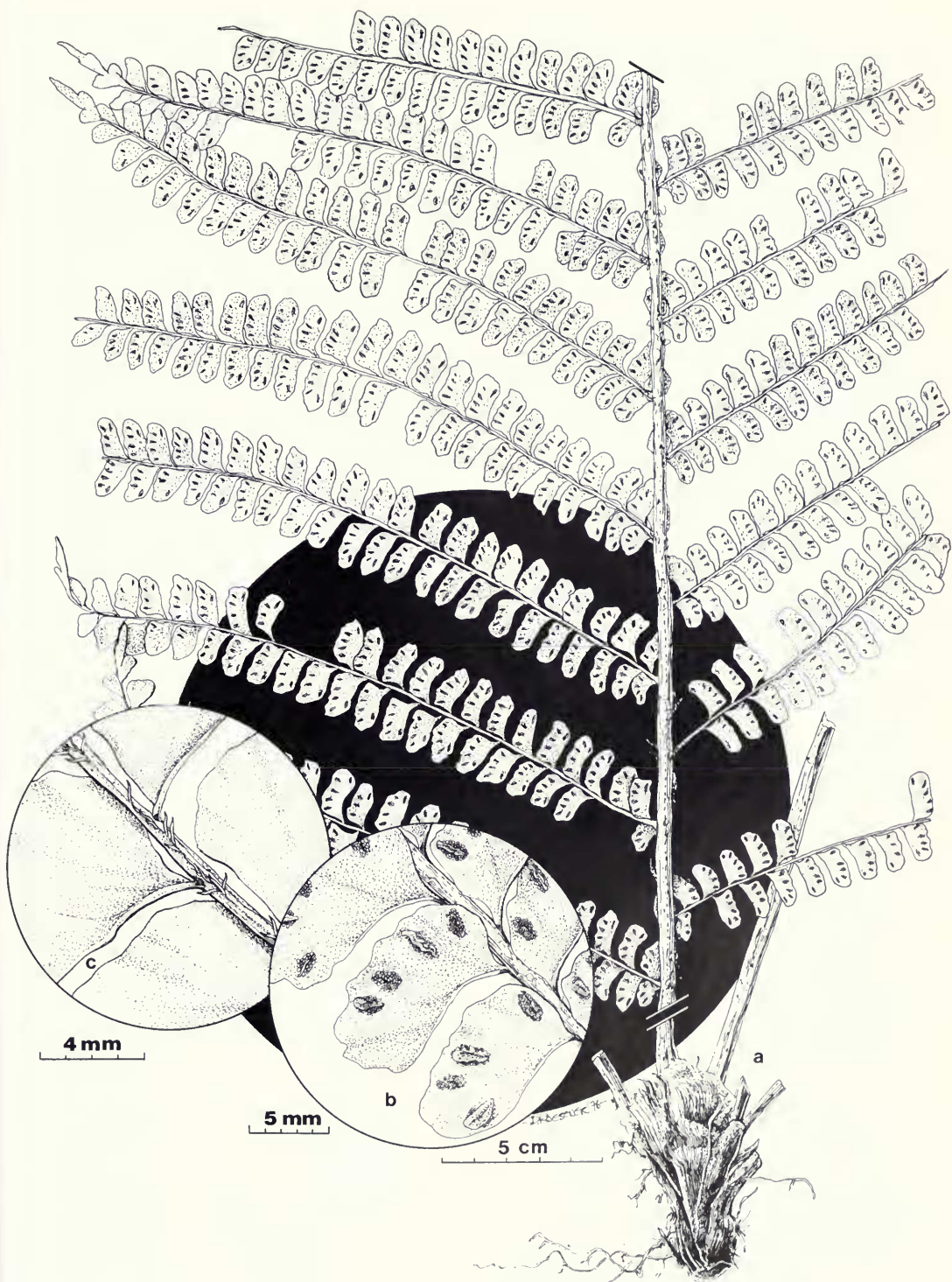


FIG. 10. *Didymochlaena truncatula*: a, stem and portion of lamina; b, pinnules, abaxial side; c, portion of costule with pinnule bases, adaxial side. (From Stolze, Ferns & fern allies of Guatemala. 1981.)

brous or slightly scaly, the rachis with long processes at the base of the pinnae on the adaxial side. **Sori** covered by an elongate indusium, on each side of a vein, and continuous distally.

Wet forests and rain forests, 110–900 m, Amazonas to Cuzco and Madre de Dios.

Tropical America; Old World.

This is a highly distinctive species, unusual in its pantropical distribution. In Peru, it has been most commonly collected in Loreto.

Amazonas: Río Marañón above Cascadas de Mayasi, *Wurdack* 2015 (GH, US). Serranía de Bagua, above La Peca, *Barbour* 2390 (MO). **San Martín:** Prov. Mariscal Cáceres, Tocache Nuevo, *J. Schunke* V. 6905 (F, MO, US). Prov. Mariscal Cáceres, Cerro Santa Cruz, *J. Schunke* V. 8036 (MO, USM). Prov. Rioja, Pedro Ruíz-Moyabamba, *D. Smith* 4430 (MO). **Loreto:** Río Itaya, Soledad, *Killip & Smith* 29768 (F, GH, US). Prov. Maynas, Yanamona, *McDaniel* 16195 (GH). Alto Amazonas, Andoas, *Vásquez* 4400 (MO). **Huánuco:** Tingo María, *Stork & Horton* 9473 (F, UC, US). **Pasco:** Prov. Oxapampa, vicinity of Chequitavo, *D. Smith* 5263 (MO). **Junín:** Chanchamayo Valley, *C. Schunke* 8 (F, US). **Ucayali:** Prov. Coronel Portillo, between La Divisoria and El Boqueron, *Plowman & Kennedy* 5768 (F, GH). **Cuzco:** Prov. Quispichanchi, Punkiri, *Vargas* 15408, 16108 (GH). **Madre de Dios:** Prov. Manú, Shintuya, *Vargas* 17837 (GH), *Foster et al.* 3143 (GH, US).

XI. *Stigmatopteris*

Contributed by Robbin C. Moran

Stigmatopteris C. Chr., Bot. Tidsskr., 29: 292. 1909. TYPE: *Polypodium flavopunctatum* Kaulf. = *Stigmatopteris rotundata* (Willd.) C. Chr. (*Aspidium rotundatum* Willd.). **Figure 11.**

Dryopteris subgenus *Stigmatopteris* (C. Chr.) C. Chr., Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd., ser. 7, 10: 73. 1913.

Key to Species of *Stigmatopteris*

- a. Veins free b
- b. Lamina 1-pinnate-pinnatifid c

FIG. 11. *Stigmatopteris heterophlebia*: a, habit; b, portion of pinna, abaxial side. *Stigmatopteris pellucidopunctata*: c, portions of pinna segments, adaxial side. (a, b from *Moran* 3165, Costa Rica, F; c from *Brant et al.* 1679, Colombia, F.)

Plants terrestrial. **Stem** short-creeping to erect. **Lamina** 1-pinnate to 2-pinnate-pinnatifid, tapering to a pinnatifid apex, glabrous on both surfaces, with internal, pellucid (sometimes drying black) punctate glands. **Pinnae** commonly linear to narrowly oblong, the apices long-acuminate and serrate. **Rachis and costae** stramineous to brown, scaly, the scales thin, flaccid, usually ending in a papillose-glandular tip. **Groove** of the costae pubescent within, the trichomes less than 0.1 mm long. **Veins** free to irregularly anastomosing, curved-ascending, ending behind the margin in a clavate tip. **Sori** round or slightly oblong near the costae. **Indusium** absent, but some species with an indusiumlike scale.

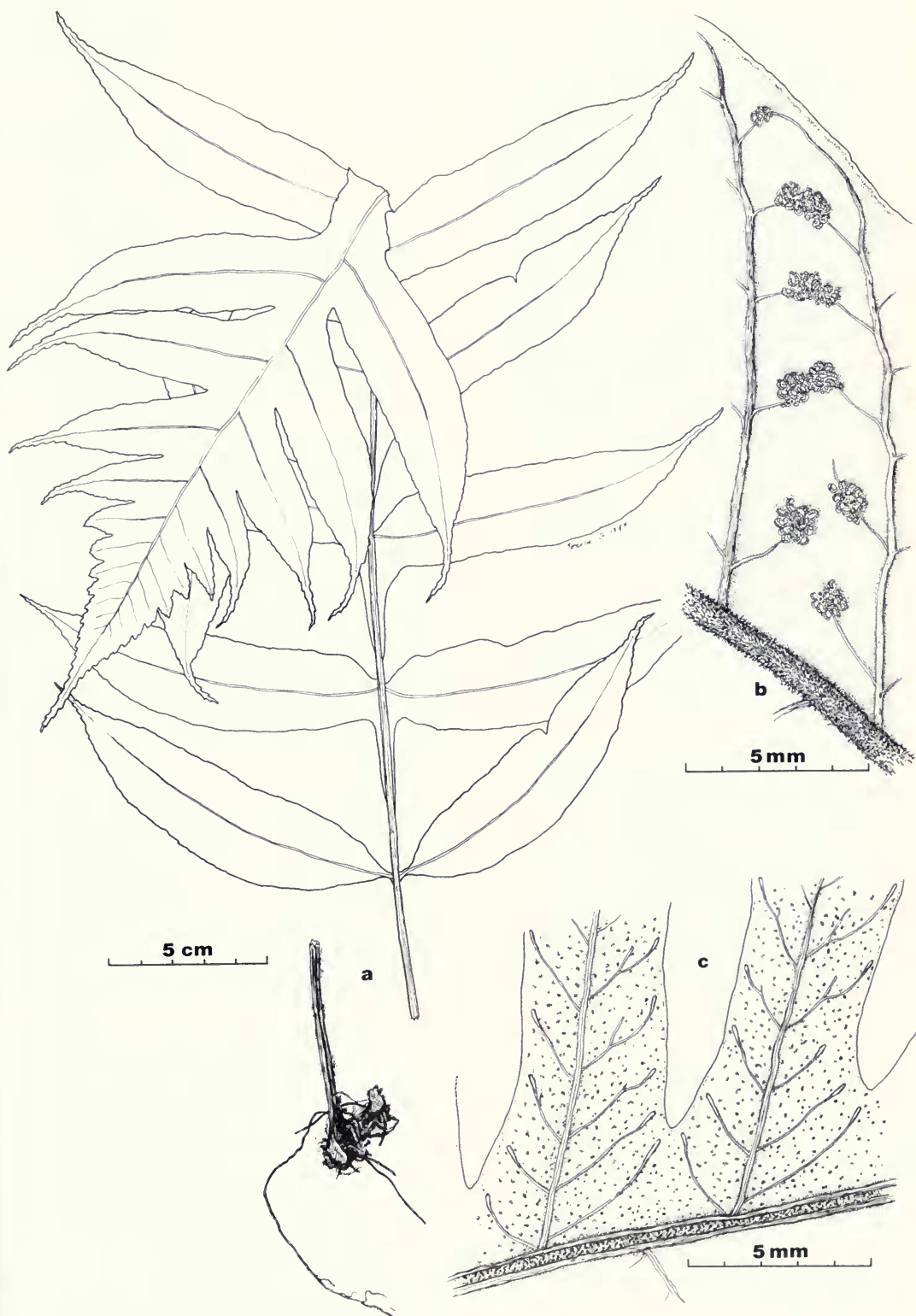
The genus contains about 25 species, with distribution from southern Mexico to southeastern Brazil and the Antilles. The most distinctive feature of *Stigmatopteris* is the internal punctate glands. These glands are most easily seen when the leaf is held between the eye and a light, but are also visible under a microscope (oblique light) as tiny, raised bumps.

References

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CHRISTENSEN, C. 1920. A monograph of the genus *Dryopteris*, part 2. The tropical American bipinnate-decompound species. Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd., ser. 8, 6: 1–132.



- c. Pinnae cut ca. $\frac{3}{4}$ to the costa 1. *S. pellucidopunctata*
 c. Pinnae entire or cut less than $\frac{1}{4}$ to the costa 2. *S. longicaudata*
 b. Lamina 2-pinnate-pinnatifid 3. *S. lechleri*
 a. Veins anastomosing d
 d. Rachis and costae densely puberulent 4. *S. heterophlebia*
 d. Rachis and costae lacking trichomes 5. *S. opaca*

1. *Stigmatopteris pellucidopunctata* (C. Chr.) C. Chr., Bot. Tidsskr. 29: 304. 1909. **Figure 11c.**

Polypodium macrophyllum Hooker, Sp. fil. 4: 241. 1862, *nom. illeg.*, not (Blume) Mett. 1856. TYPE: Peru, San Martín, Mt. Guayrapurima, August 1856, *Spruce 4720* (holotype, K!; isotypes, BM!, G!, P!, US!; photos, F, GH, MO, NY, all of BM).

Dryopteris pellucido-punctata C. Chr., Index fil. 283. 1905, *nom. nov.* for *P. macrophyllum* Hooker and with the same type.

Lamina 1-pinnate-pinnatifid. **Pinnae** 20–40 cm long and 2.5–6 cm broad, 15–20 pairs, cut ca. $\frac{2}{3}$ to the costa, sessile or the basal ones short-stalked, the stalk 2–7 mm long. **Segments** 4–10 mm broad, serrate at the apex, the margins entire, serrate or lobed. **Rachis and costae** stramineous or brown, scaly, the scales ovate, lanceolate or filiform. **Veins** free, 7–14 per segment, unbranched or 1-forked with a short ascoscopic branch bearing the sorus. **Sori** round.

Wet forests, 200–600 m, Amazonas, San Martín, Huánuco, Pasco, and Madre de Dios. Colombia; Ecuador; Peru; Bolivia.

This species closely resembles *S. ichthosma* (Sodi) C. Chr., a species known only from the western cordillera of Ecuador but which eventually may be found in Peru. It differs from *S. pellucido-punctata* by the presence of a small, scalelike indusium associated with the sorus and having only lanceolate scales on the axes (i.e., it lacks filiform scales).

Amazonas: Prov. de Bagua, Quebrada Tambillo (below km 280 of Marañón road), valley of Río Marañón above Cascadas de Mayasí, *Wurdack 2002* (GH, US, USM). **Huánuco:** Fundo Chela, Sinchono, *Aguilar 927* (USM). **Pasco:** Paujil, near Puerto Bermúdez, *León 311* (USM). **Madre de Dios:** Prov. Manú, Atalaya, vicinity of Hacienda Amazonia, 2–3 km W of village, *Foster & Wachter 7437* (MO, USM).

2. *Stigmatopteris longicaudata* (Liebm.) C. Chr., Bot. Tidsskr. 29: 300. 1909.

Polypodium longicaudatum Liebm., Kongel. Vidensk. Selsk. Skr. Naturvidensk. Afd., ser. 5, 1: 209. 1849. LECTOTYPE (designated by A. R. Smith, Fl. Chiapas, part 2: 213. 1981): Mexico, Veracruz, Baranca de Huitamalco, *Liebm. Flora Mex.* 737 (c—Folio Herbarium; ISOLECTOTYPE, K!). *Dryopteris longicaudata* (Liebm.) Maxon, Contr. U.S. Natl. Herb. 13: 18. 1909.

Lamina 1-pinnate. **Pinnae** mostly 14–20 cm long and 2.0–2.5 cm broad, linear to narrowly lanceolate, 12–20 pairs, the margins entire or with crenate lobes cut less than $\frac{1}{4}$ to the costae, the upper pinnae adnate to the rachis with a conspicuous decurrent tapering basal wing, lower pinnae free, subsessile or stalked, the stalk 2–5 mm long. **Rachis and costae** glabrous to densely scaly, the scales ovate to lanceolate, or (in Venezuela, Peru, and Bolivia) linear and fibrillose. **Veins** free, 3–6 per segment. **Sori** round, filiform scales present among the sporangia in plants from Venezuela, Peru, and Bolivia.

Wet forests, 220–2100(–2500) m, San Martín, Huánuco, Junín, Ucayali, Cuzco, and Madre de Dios.

Southern Mexico; Guatemala; Costa Rica; Panama; Venezuela; Peru; Bolivia.

This species is distinctive in its decurrent, tapering wings from the pinna bases, which are usually confluent in the distal $\frac{1}{2}$ to $\frac{1}{3}$ of the lamina.

San Martín: Mt. Guayrapurima, near Tarapoto, *Spruce 4012* (BM, G, K, P). **Huánuco:** Tingo María, *Tryon & Tryon 5330* (BM, F, GH). **Junín:** E of Quimiri Bridge, near La Merced, *Killip & Smith 23906* (NY, US). Ridge E of Tingo María, *Allard 22558* (US). **Ucayali:** Prov. Coronel Portillo (as Loreto), Sinchono, cerca de la Divisoria, *Aguilar 861* (GH, USM). Sinchono (as Loreto), entre Tingo María y Pucallpa, *Aguilar 865* (GH). **Cuzco:** Prov. Paucartambo, Cosñipata Valley, Río Tono, first foothill ridge on road N of Patria, *Wachter et al. 200* (F). **Madre de Dios:** Prov. Manú, Cerro de Pantiacolla, Río Palotoa, 10–15 km NNW of Shintuya, transect to ridgetop, *Foster et al. 10908* (F). Parque Nacional del Manú, Cocha Cashu Biological Station, *Foster P-84-91* (F).

3. *Stigmatopteris lechleri* (Mett.) C. Chr., Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd., ser. 8, 6: 28. 1920.

Phegopteris lechleri Mett., Fil. lechl. 2: 25. 1859. TYPE: Peru, Puno, "St. Gaban" (San Gabán), *Lechler* 2497 (holotype, B!; frag., BM!).

Polypodium punctatum Hooker, Sp. fil. 4: 262, 1862, *nom. illeg.*, not (L.) Swartz, 1802. LECTOTYPE (designated by Christensen, Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd., ser. 7, 10: 79. 1913): Peru, San Martín, Tarapoto, Mt. Guayrapurima, August 1856, *Spruce* 4719 (κ!; ISOLECTOTYPES, G!, P!; photos, F, MO of κ).

Polypodium prasinum Baker, Syn. fil. 312. 1867, *nom. nov.* for *Polypodium punctatum* Hooker and with the same type.

Dryopteris prasina (Baker) C. Chr., Index fil. 285. 1905. *Stigmatopteris prasina* (Baker) C. Chr., Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd., ser. 7, 10: 79. 1913.

Stigmatopteris ecuadorensis C. Chr., Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd., ser. 8, 6: 29. 1920. TYPE: Ecuador (Andes of Quito), *Sodi*ro (holotype, B!; isotypes, BM!, P).

Lamina 2-pinnate-pinnatifid. **Pinnæ** 25–40 cm long and 5–15 cm broad, widest at the base. **Pinnules** 4–10 cm long and 1.0–2.3 cm broad, narrowly lanceolate-triangular, sessile to broadly adnate and decurrent, the lobes oblong to rectangular, entire to serrate apically. **Rachis** and **costae** stramineous or brown, scaly, the scales linear or narrowly triangular, tortuous, fibrillose. **Veins** unbranched or rarely (in the larger segments) branched, nearly reaching the margin. **Sori** round.

Wet forests, 200–1700 m, San Martín, Huánuco, Pasco, and Puno.

Costa Rica; Venezuela; Colombia; Ecuador; Peru.

This species, with its 2-pinnate-pinnatifid lamina, is the most finely divided in the genus.

Huánuco: 25 km NE of Tingo María, La Divisoria, *Moran* 3696 (MO, USM). **Pasco:** Prov. Oxapampa, Gran Pajonal, north of Chequitavo, *D. Smith* 5082 (MO).

4. *Stigmatopteris heterophlebia* (Baker) R. C. Moran, *comb. nov.* **Figure 11a–b.**

Polypodium heterophlebium Baker, J. Bot. 22: 363. 1884. TYPE: Costa Rica, Prov. unknown, Laguna, 305 m, *Harrison* 59 (holotype, κ!).

Dryopteris heterophlebia (Baker) C. Chr., Index fil. 270. 1905.

Lamina 1-pinnate. **Pinnæ** 10–16(–18) cm long and 2.5–3.5(–4.5) cm broad, widest at or near the base, the margins entire to crenate, the base adnate and decurrent to or nearly to the next pinna pair, free pinnae pairs 1–3, the basal pinnae usually somewhat reduced, widest near the middle, stalked, the stalk 2–4 mm long. **Rachis** and **costae** tan, light brown, or stramineous, puberulent and scaly, the hairs less than 0.1 mm long, erect, capitate-glandular (when fresh), the scales to 3 mm long, lanceolate, not fibrillose. **Veins** anastomosing irregularly. **Sori** discrete or confluent where the veins anastomose.

Wet forests, 100–1900 m, Loreto.
Nicaragua to Peru.

Differing from the closely related *S. alloeoptera* (Kunze) C. Chr., which grows in Venezuela and Colombia, by the glandular hairs on the axes and fewer pinna pairs.

Loreto: Santa Rosa, lower Río Huallaga below Yuriaguas, *Killip & Smith* 28984 (NY).

5. *Stigmatopteris opaca* (Baker) C. Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Afd., ser. 7, 10: 78. 1913.

Meniscium opacum Baker, J. Bot. 166. 1877. TYPE: Ecuador, Andes of Quito, *Sodi*ro 54/3 (holotype, κ!; photos, BM, GH, US, all of κ).

Polypodium oligophlebium Baker, Syn. fil. ed. 2, 506. 1874, *nom. illeg.*, not Kunze, 1850. TYPE: Peru, San Martín, Tarapoto, Cerro de Guayrapurima, *Spruce* 4653 (holotype, κ!).

Dryopteris christii C. Chr., Index fil. 257. 1905, *nom. nov.* for *Meniscium opacum*, and with the same type, not *Dryopteris opaca* (Don) C. Chr. 1905.

Dryopteris paucinervata C. Chr., Index fil. 283. 1905, *nom. nov.* for *Polypodium oligophlebium* Baker, and with the same type.

Lamina 1-pinnate, opaque, the internal glands not visible. **Pinnæ** 12–27 cm long and 3–5 cm broad, widest at or just above the base, the margins entire to crenate, the base sessile, the upper pinnæ with a short decurrent base, the basal pinnæ nearly equalling the above pinnæ, widest near the middle, sessile. **Rachis** and **costae** lacking hairs, scaly, the scales lanceolate to linear or amorphous. **Veins** anastomosing, those of the sterile leaf with a single excurrent vein projecting from the apex where the two lateral veins join. **Sori** round, oblong, or arcuate.



FIG. 12. *Cyclodium trianae*: a, lamina; b, stem and petiole base. *Cyclodium meniscioides* var. *meniscioides*: c, lamina apex; d, fertile pinna; e, sori. (a, b from Ellenberg 3257, Ecuador, GH; c, d from Fiebrig 6344, Paraguay, F; e from Schunke V. 5610, F.)

Wet forests, 250–600 m.

Ecuador and Peru.

In Peru known only from Spruce's type collection of *Polypodium oligophlebium* from San Martín.

XII. *Cyclodium*

Cyclodium Presl, Tent. pterid. 85. 1836. LECTOTYPE (designated by John Sm., Hist. fil. 203. 1875): *Aspidium confertum* Kaulf. = *Cyclodium meniscioides* (Willd.) Presl. **Figure 12a–b.**

Peltochlaena Fée, (Mém. foug. 5) Gen. fil. 289. 1852, nom. provis., illegit.

Stem usually rather short-creeping and moderately stout, to long-creeping (to 5 m when climbing), bearing scales. **Leaves** ca. 30 cm to 2 m long, petiole continuous. **Lamina** 1-pinnate to 2-pinnate-pinnatifid or rarely 3-pinnate at the base, or rarely simple, usually slightly short-pubescent or scaly, monomorphic to dimorphic and then the fertile more erect, longer, and with less expanded segments. **Veins** free or anastomosing, with or usually without included free veinlets. **Sori** roundish,

borne on the veins, not paraphysate, covered by often fugacious indusia which are peltate or orbicular-reniform with a narrow sinus. **Spores** ellipsoidal to spheroidal, monoletate, slightly to strongly ridged, usually finely papillate.

Cyclodium is a tropical American genus of ten species. It was formerly treated in *Stigmatopteris* (Tryon & Tryon, 1982), but the revision by Smith (1986) clearly shows that it is distinct from, and perhaps not closely related to, that genus.

There are two species in Peru, and an additional one may occur there (see **Comments**).

This treatment has been adapted from that of Smith (1986) and has been prepared with the collaboration of Dr. A. R. Smith.

References

- SMITH, A. R. 1986. Revision of the Neotropical fern genus *Cyclodium*. Amer. Fern J., 76: 56–98.
TRYON, R. M., AND A. F. TRYON. 1982. *Stigmatopteris*, pp. 519–524 in Ferns and allied plants, Springer-Verlag, New York.

Key to Species of *Cyclodium*

- a. Veins all free; lamina 1-pinnate-pinnatifid to 3-pinnate at the base, the apex gradually reduced . . . 1. **C. trianae**
a. Veins regularly anastomosing; lamina 1-pinnate, with a conform (or nearly) apical segment . . . 2. **C. meniscioides**

1. **Cyclodium trianae** (Mett.) A. R. Sm., Amer. Fern J. 76: 92. 1986. **Figure 12a–b.**

Aspidium trianae Mett., Ann. Sci. Nat. Bot. 5, 2: 243. 1864. TYPE: Colombia, Prov. Barbacoas (Nariño), via de Túquerres, *Triana* “32” (holotype, B; isotype, BM; both seen by A. R. Smith; photos of BM at UC, US).

Nephrodium firmifolium Baker, Syn. fil., ed. 2, 501. 1874. TYPE: Peru (San Martín), Mt. Guayapurima, near Tarapoto, *Spruce* 4662 (holotype, K; isotypes BM, BR, P; all seen by A. R. Smith).

Terrestrial, stem creeping. **Leaves** monomorphic or only slightly dimorphic, gradually reduced at the apex. **Lamina** 1-pinnate-pinnatifid to usu-

ally 2-pinnate or 2-pinnate-pinnatifid, or 3-pinnate only at the base. **Veins** free. **Sori** with orbicular-reniform indusia with a narrow sinus, or rarely peltate.

In dense primary forests or partly cleared forests, 300–900 m, Lambayeque and Loreto, south to Junín.

Panama, south to Peru.

Var. *trianae* occurs throughout the range of the species. In South America it is generally confined to the Amazonian side of the Andes. Var. *chocoense* A. R. Sm. is only in Panama and the Pacific side of the Andes in Colombia. The only representative in Peru is var. *trianae*.

Lambayeque: Puerto Nazareth, 5 km from Olmos, *El-lenberg 3449* (GH). **Loreto:** Balsapuerto, *Killip & Smith 28540* (GH, NY, US). **Pasco:** Prov. Oxapampa, Río Palcazú, cerca de Iscozacín, *León 712* (GH). Prov. Oxapampa, Palcazú valley, Iscozacín, *Foster 9498* (MO). **Junín:** Prov. Satipo, above Pichanaki, *León 216* (GH).

2. **Cyclodium meniscioides** (Willd.) Presl, Tent. pterid. 85. 1836.

Terrestrial or epiphytic and short-climbing to 2 m. **Leaves** subdimorphic to strongly dimorphic,

Key to Varieties

- a. Margins of the pinnae entire, sinuate, crenulate to crenate 2a. var. **meniscioides**
- a. Margins of the pinnae, especially toward the apex of the sterile ones, sharply serrate 2b. var. **paludosum**

2a. **Cyclodium meniscioides** var. **meniscioides**. Figure 12c-e.

Aspidium meniscioides Willd., Sp. pl. ed. 4, 5: 218. 1810. TYPE: Brazil, *Hoffmannsegg* (holotype, B!, Herb. Willd. 19737; photo, GH).
Stigmatopteris meniscioides (Willd.) Kramer, Proc. Kon. Nederl. Akad. Wetensch. C, 71: 521. 1968.

In dense primary forests, in swampy forests where sometimes epiphytic, or in partly disturbed forests, rarely on fallen logs or epiphytic to 2 m, 100–650 m, Amazonas south to Madre de Dios. Range of the species.

Amazonas: Near Pongo Mori, Río Comain, *Berlin 949* (MO, UC). Prov. Bagua, 34 km NE of Chiriaco, *Barbour 4401A* (MO). **San Martín:** Prov. Mariscal Cáceres, Tocache Nuevo, *J. Schunke V. 5610* (F, US). 23 km S of Nuevo San Martín, *Gentry et al. 37573* (MO). **Loreto:** 7 km SW of Iquitos, *Croat 18579* (GH, MO, UC). Above Pongo de Manseriche, *Mexia 6193a* (GH, UC, US). Mishu-yacu, near Iquitos, *Klug 241* (F, US). **Pasco:** Puerto Bermúdez (as Junín), *Killip & Smith 26566* (US). Prov. Oxapampa, Palcazú valley, *D. Smith 3733* (MO, UC). **Ucayali:** Vicinity of Aguaytía, *Mathias & Taylor 5138* (F). **Madre de Dios:** Prov. Manú, Cerro de Pantiacolla, *Foster et al. 10704* (F).

2b. **Cyclodium meniscioides** var. **paludosum** (Morton) A. R. Sm., Amer. Fern J. 76: 87. 1986.

the fertile then more erect and with shorter and narrower pinnae. **Lamina** 1-pinnate or rarely simple, with a conform (or nearly) apical segment, the pinnae entire to strongly crenulate. **Veins** anastomosing, usually with included free veinlets. **Sori** with peltate indusia.

Trinidad; and widely distributed in tropical South America.

In addition to the two varieties in Peru, there is var. *rigidissimum* (C. Chr.) A. R. Sm., which rarely occurs in Guyana and perhaps in Venezuela.

Dryopteris paludosa Morton, Bull. Torrey Bot. Club 66: 50. 1939. TYPE: Colombia, Antioquia, Puerto Berrio, *Pennell 3723* (holotype, NY; frag., US, both seen by A. R. Smith).
Stigmatopteris paludosa (Morton) R. & A. Tryon, Rhodora 83: 136. 1981.

160 m, Loreto. Colombia and Peru.

Loreto: Bersalles-Iquitos, *Vargas 11476* (GH).

Comments

Cyclodium guianense (Klotzsch) Gómez, Phytologia 60: 371. 1986.

Aspidium guianense Klotzsch, Linnaea 20: 364. 1847. TYPE: “British Guiana,” *Schomburgk 1157* (holotype; B?; isotypes, K, UC, seen by A. R. Smith).
Stigmatopteris guianensis (Klotzsch) C. Chr. Ind. fil suppl. 3: 174. 1934.

This species occurs in Trinidad, northern South America, and in the Amazon basin of Colombia, and may occur in Peru. It has all of the veins free, as in *C. trianae*, but has a 1-pinnate lamina rather than a 2-pinnate to 2-pinnate-pinnatifid one, and peltate indusia rather than orbicular-reniform ones, these with a narrow sinus. Only rarely does *C. trianae* have peltate indusia.

XIII. Polystichum

Polystichum Roth, Tent. fl. germ. 3: 31, 69. 1799.

TYPE: *Polystichum lonchitis* (L.) Roth (*Polypodium lonchitis* L.). **Figure 13.**

Plecosorus Fée, (Mém. fam. foug. 5) Gen. fil.: 150. 1852. TYPE: *Plecosorus mexicanus* Fée = *Plecosorus speciosissimus* (Kunze) Moore = *Polystichum speciosissimum* Kunze) R. & A. Tryon.

Stem decumbent to erect, often small, to stout, bearing stramineous to blackish scales. **Leaves** 5 cm to often 1 m or rarely 3 m long, petiole continuous. **Lamina** usually 1-pinnate, 2-pinnate, or to 3-pinnate-pinnatifid, rarely entire to pinnatifid, more or less scaly, often densely so, monomorphic or rarely dimorphic, adaxial side of the costa sulcate to nearly flat. **Veins** free. **Sori** round, borne on the veins, not paraphysate, covered by persistent to fugacious, peltate indusia, or (in all Peruvian species) exindusiate. **Spores** ellipsoidal to spheroidal, monolete, saccate, cristate, or ridged, often spinulose and frequently perforate.

Polystichum is a large, nearly worldwide genus of about 150 species. There are perhaps 25 species in America and four in Peru. The species of Andean *Polystichum* are not well known, and the following treatment is tentative. Species of *Polystichum* are evidently variable genetically and cytologically and they also vary in different environments. Population studies, cytological studies, and broad morphological comparisons are needed in order to recognize and define the taxa (Barrington, 1985). Currently unrecognized hybrids may be an important element in the apparent intergradation of taxa.

Although characters of the scales of the leaf axes are emphasized in the key to species by Smith (1985), among others, these have been found to be usually variable in Peru and are not generally

employed in this treatment. However, these structures need further investigation and may be more important than now considered.

Among the synonyms, only those names based on Peruvian material and those that are in general use are included. The names of many species recognized, especially from Ecuador, Bolivia, and southeastern Brazil, have not otherwise been included.

Although Christensen (Index fil. 727. 1906) indicated that the first publication of the generic name *Polystichum* was in Arch. Bot. (Leipzig) 2(1). 1799, Taxonomic Literature-2 indicates that Roth's publication was in 1799 while Arch. Bot. (Leipzig) 2(1) was in 1800.

This treatment has been prepared with the perspective and critical collaboration of Dr. David S. Barrington, who has seen some of the types cited.

The key will be adequate for the identification of many complete collections. However, in some cases, a concordance of the majority of the characters mentioned may be necessary for identification, and rarely materials may represent a variation that is not accounted for in the key.

References

BARRINGTON, D. S. 1985. The present evolutionary and taxonomic status of the fern genus *Polystichum*: The 1984 Botanical Society of America Pteridophyte Section Symposium. Amer. Fern J., 75: 22-28.
SMITH, A. R. 1985. Pteridophytes of Venezuela, an annotated list, pp. 189-192, published by the author, Department of Botany, University of California, Berkeley.
TRYON, R. M., AND A. F. TRYON. 1982. *Polystichum*, pp. 524-538, in Ferns and allied plants, Springer-Verlag, New York.

Key to Species of *Polystichum*

- a. Petiole with scales few or not persistent above its base, varying to densely scaly, scales mostly small, to ca. 0.5 cm long, elongate, rarely larger and broad; rachis with flattish scales and/or fibrils; pinnules with revolute margins or plane (flat) b
- b. A scaly bud usually present in the axil of a pinna near the apex of the lamina, or more than one present; apical portion of the lamina usually prolonged, with a 1-pinnate portion 5-10 cm long with pinnae mostly 1-2.5 cm long, or longer 2. **P. platyphyllum**

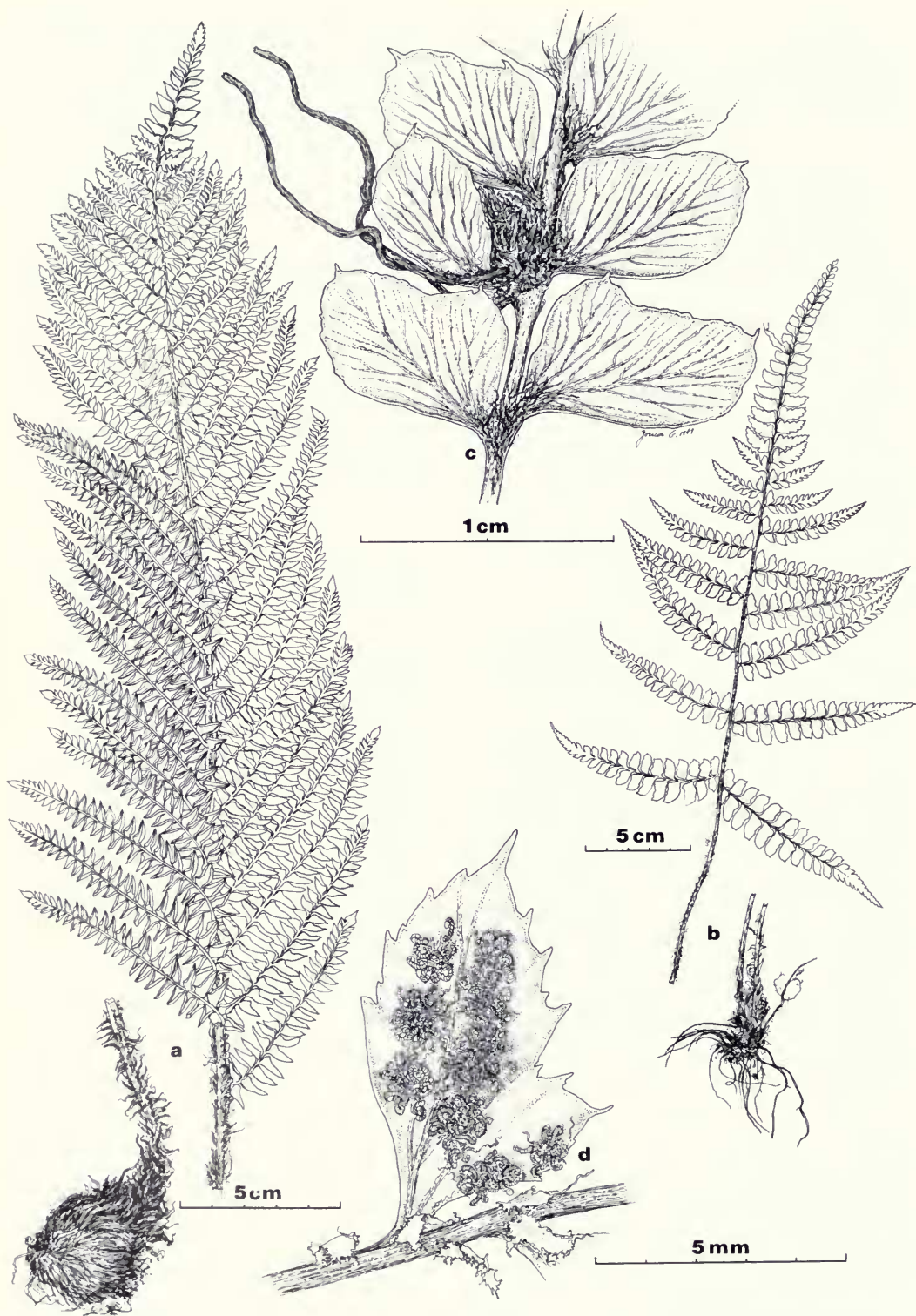


FIG. 13. *Polystichum pycnolepis*: a, habit. *Polystichum platyphyllum*: b, habit; c, distal pinnae, with proliferous bud; *Polystichum montevidense* var. *montevidense*: d, pinnule. (a from Madison 1034, GH; b, c from Macbride 4034, F; d from Soukup 4329, F.)

- b. Apex of the lamina lacking a scaly bud, usually gradually reduced, if prolonged the 1-pinnate portion short with most pinnae less than 1 cm long c
- c. Pinnules definitely mucronate, usually plane (flat), or if the margins revolute then the apical mucro plane; lamina 2-pinnate; if the lamina less than 8 cm broad then the basal pinnae reflexed and/or the lamina apex prolonged, the apex of the pinnae acute to attenuate; or if the lamina over 8 cm broad then the basal pinnae patent or reflexed 1. **P. montevidense**
- c. Pinnules sometimes definitely mucronate and plane, usually not or hardly mucronate, often with the margins and apical mucro revolute; lamina 2-pinnate to 3-pinnate; the lamina usually less than 8 cm broad and the basal pinnae patent or ascending, the lamina apex not or hardly prolonged, and the apex of the pinnae obtuse to subacute; or if the lamina over 8 cm broad, then the basal pinnae ascending 3. **P. orbiculatum**
- a. Petiole with scales usually persistent above its base, mostly large, ca. 1–2 cm long and sometimes to 1 cm broad; rachis, at least at the base, usually with some brown or darker, involute or twisted scales, these often also on the petiole; pinnules with revolute margins; apex of the lamina lacking a scaly bud 4 **P. pycnolepis**

1. **Polystichum montevidense** (Sprengel) Rosenst.,
Hedwigia 46: 111. 1906.

Leaves ca. 10 cm to 1.5 m long. Petiole scales sparingly persistent or persistent, especially at or near the base, or petiole nearly devoid of scales; scales brown to dark brown or darker, less than 1 cm long or rarely longer. Lamina 2-pinnate to rarely 3-pinnate at the base of some pinnae; ca. 2–40

cm broad; the apex lacking a bud, gradually to sometimes rather abruptly reduced, or prolonged. Rachis bearing a few to many light brown to dark brown fibrils and narrow scales, or sometimes broader ones, or nearly devoid of scales. Pinnae mostly patent, the apex acute to usually attenuate and deeply pinnatifid to the tip; basal pinnae reduced or not, patent or reflexed; pinnules plane (flat) or nearly so.

Key to Varieties of *Polystichum montevidense*

- a. Leaves ca. 50 cm to 1.5 m, mostly 60–80 cm long; lamina ca. 10 to 40 cm broad, mostly 2 to 2½ times as long as broad, the apex gradually to sometimes rather abruptly reduced, the portion beyond the 2-pinnate portion shorter than the longest pinna; basal pinnae not or slightly reduced, patent or somewhat ascending 1a. var. **montevidense**
- a. Leaves ca. 10–90 cm, mostly ca. 30 cm long; lamina ca. 2–11 cm, mostly ca. 6 cm broad, mostly 3 to 4 times as long as broad, the apex usually prolonged, the portion beyond the 2-pinnate portion longer than the longest pinna; basal pinnae reduced and/or reflexed 1b. var. **nudicaule**

1a. **Polystichum montevidense** var. **montevidense**.
Figure 13d.

Polypodium montevidense Sprengel, Syst. veg., ed. 16, 4: 59. 1827. TYPE: Uruguay, Monte Video, *Sello* (not located).

Polystichum lehmannii Hieron., Bot. Jahrb. Syst. 34: 452. 1904. TYPE: Colombia, Prov. Cauca, Los Motilones, *Lehmann 3674* (holotype: \bar{v} ; isotype, us!).

Polystichum mexiae Copel., Univ. Calif. Publ. Bot. 19: 299. 1941. TYPE: Ecuador, Prov. Pichincha, Nono to Mindo, *Mexia 7679* (holotype, \bar{u} ; isotypes, \bar{f} !, \bar{g} !).

In dry rocky places and on open hillsides, more often in forests in rocky places, and in cloud forests, 1800–3600 m, Piura to Puno.

Venezuela and Colombia, south to Bolivia, east through Argentina to Uruguay and southeast Brazil; possibly in Central America.

Recent studies have usually confined *Polystichum montevidense* to northwestern Argentina and eastward to southeastern Brazil. However, Peru materials are not separable, and the species is best regarded as an Andean one, with an extension eastward. Intergradation between var. *montevidense*

and var. *nudicaule* indicates that the two are not distinct species. In spite of the several characters presented in the key, there is considerable overlap between the two taxa.

Plants with the leaves especially scaly on the rachis and pinna-rachises have been referred to *Polystichum montevidense* var. *squamulosum* (Hieron.) Hieron., but this seems appearance to be a part of the normal variation of the species in Peru. *Polystichum yungense* Rosenst. of Bolivia is probably a large, well-developed variation of this species.

Piura: Abayaca, *Soukup* 4329 (F, US). **Cajamarca:** Prov. Contumazá, Cascas-Contumazá, *López et al.* 9109 (GH). Prov. Hualgayoc, Monte Seco, *Soukup* 3816 (F, US). Prov. San Miguel, Cerro Quillón, *Mostacero et al.* 1293 (F, GH). **Amazonas:** Prov. Bagua, SE of La Peca, *Barbour* 3696 (UC), 3984 (MO). **San Martín:** Lamas, *Belshaw* 3428 (GH, UC, US). Prov. Mariscal Cáceres, Río Abiseo National Park, *Young & León* 4586 (F). **Huánuco:** Mito, *Macbride & Featherstone* 1698 (F, GH, US). Yanano, *Macbride* 3827 (F, US). **Pasco:** Prov. Oxapampa, San Alberto, *van der Werff et al.* 8433 (MO, UC). **Ayacucho:** Between Huanta and Río Apurímac, *Killip & Smith* 23239 (GH). **Cuzco:** Prov. Urubamba, Chupani, *Vargas* 11126 (GH). Prov. La Convención, between Rumichurco and Alcobamba, *Davis et al.* 1227 (F, GH). **Puno:** Prov. Sandía, entre Sandía y Cuyocuyo, *Ferreyra* 16818 (GH, USM).

1b. *Polystichum montevidense* var. *nudicaule* (Rosenst.) Tryon, *comb. nov.*

Polystichum nudicaule Rosenst., Repert. Spec. Nov. Regni Veg. 11: 56. 1912. SYNTYPES: Bolivia, Unduavi, 3400 m, *Buchtien* 2657, 2658, 2659, 2662 (not located); ISOSYNTYPES, *Buchtien* 2657 (us), 2658 (uc!, us), 2659 (us).

Rocky crevices, on cliffs, at base of rocks, and in boggy places in heath, 1800–4000 m, Piura to Puno.

Venezuela and Colombia, south to Bolivia; perhaps in southeastern Brazil and Chile.

This variety is distinguished especially by its prolonged lamina apex and the usually reflexed and reduced basal pinnae. It intergrades with var. *montevidense* and perhaps represents a variation of it growing under less favorable conditions. *Polystichum wolfii* Hieron. from Bolivia is probably this variety.

A few collections have some leaves on the stem with closely spaced and nearly entire pinnules and also some that have widely spaced and rather laciniate pinnules.

Piura: Prov. Huancabamba, above Cachaque on road to Huancabamba, *Hutchison* 1643 (GH, UC). **Cajamarca:** Prov. Cajamarca, Cajamarca-Bambamarca, *Smith & Vásquez* 3477 (UC). Prov. Contumazá, Las Achiras, *Sagástegui* 3887 (GH, HUT). **Amazonas:** Prov. Chachapoyas, NNE of Diosan, *Wurdack* 1596 (F, GH, UC, US). **La Libertad:** Prov. Santiago de Chuco, Laguna El Toro, *D. Smith* 2300 (GH). **San Martín:** Río Abiseo National Park, *Young & León* 4401 (F). **Huánuco:** Cani, *Macbride* 3459 (F, US). Tambo de Vaca, *Macbride* 4420 (F, US). **Lima:** Prov. Huarochiri, Dist. San Mateo, *Saunders* 324 (F, UC). Ruinas de Cantamarca, *Coronado* 297 (GH, UC). **Junín:** Incahuasi, *Soukup* 3177 (F). Near Huancayo, *Killip & Smith* 23366 (US). **Ayacucho:** Between Huanta and Río Apurímac, *Killip & Smith* 22254 (US). **Apurímac:** Prov. Andahuaylas, Dist. Chincheros, *Saunders* 737 (GH). Prov. Abancay, Curahuasi, *Marín* 1961 (F). **Cuzco:** Prov. Cuzco, Saxihuamán, Cuzco, *Tryon & Tryon* 5359 (GH, US). Taucsa, *Davis et al.* 1540 (F). **Puno:** Granja Salcedo, *Soukup* 66 (F). Ilave, *Soukup* 872 (F).

2. *Polystichum platyphyllum* (Willd.) Presl, Tent. pterid. 84. 1836. **Figure 13b–c.**

Aspidium platyphyllum Willd., Sp. pl., ed. 4, 5: 255. 1810. TYPE: Venezuela, Caracas, *Bredemeyer* (holotype; B!, *Herb. Willd.* 19879; photo, GH).

Leaves ca. 40 cm to 1.5 m long. **Petiole scales** sparingly or not persistent, light brown to brown, or especially near the base dark brown; less than 1 cm long, rarely longer. **Lamina** 2-pinnate, or rarely nearly 3-pinnate at the base of some pinnae, ca. 10–30 cm broad; the apex with the axil of a pinna bearing a scaly bud, or more than 1 axil bearing a bud, the apex usually prolonged, very gradually, or sometimes abruptly reduced. **Rachis** bearing mostly few, sometimes many, light brown to brown fibrils and narrow scales, some broader scales also often present. **Pinnae** patent, apex acute or to attenuate and deeply pinnatifid to the tip; basal pinnae the longest to somewhat reduced, usually slightly ascending or patent, rarely reflexed; pinnules plane (flat).

In primary forests, on steep forested slopes, in ravines and along stream banks, and on open, rocky, moist road banks, 600–2800 m, Cajamarca and Amazonas to Puno.

Southern Mexico and Central America; Jamaica; Venezuela and Colombia, south to northwestern Argentina and east to southeastern Brazil.

Nearly all leaves of this species have a bud near the apex of the lamina, and perhaps all plants have at least one leaf with a laminar bud. In a collection

from a large population (*Tryon & Tryon 5404*, GH) all leaves except one very small one have a bud. In old leaves, this bud may develop into a small plantlet, with roots and small leaves. Other distinctive characters of this species are mentioned in the key.

Cajamarca: Prov. Santa Cruz, Monte Seco, *Sagástegui et al. 12407* (F, MO). Prov. Hualgayoc, Hacienda Taulis, *Hutchison & Bismark 6331* (F, GH, MO, UC, US). **Amazonas:** Prov. Chachapoyas, Quebrada Molino, *Wurdack 771* (F, GH, UC, US). Prov. Bagua, 12 km E of La Peca, *Barbour 2400* (F, MO, UC). **San Martín:** Near Tarapoto, *Spruce 3965* (BM, GH, US). Between Tarapoto and Yurimaguas, *Croat 58100* (F). **Huánuco:** Muña, *Bryan 548* (F, GH, US), *Macbride 4034* (F, GH, US). Prov. Huánuco, near Riachuela Contalagua, *Mexia 8297* (F, GH, MO, UC, US). **Pasco:** Pichis Trail (as Junín), between San Nicolás and Azupizú, *Killip & Smith 26120* (US). Prov. Oxapampa, 5 km SE of Oxapampa, *D. Smith 2915* (GH). Junín: Chanchamayo valley, *C. Schunke 13* (F, US). Near La Merced, *Killip & Smith 23911* (GH, US). Prov. Chanchamayo, cerca a Monobamba, *Fernández & Vargas 204* (USM). **Ayacucho:** Between Huanta and Río Apurímac, *Killip & Smith 22443* (US). **Apurímac:** Prov. Andahuaylas, *Alvarado* (USM). **Cuzco:** Prov. Urubamba, near town of Machu Picchu, *Tryon & Tryon 5404* (BM, F, GH, UC, US). Prov. Urubamba, camino a Wiñayhuayna (Huiñayhuayna), *Chávez 3440* (GH, MO). **Puno:** Prov. Carabaya, *Vargas 17529* (GH).

3. *Polystichum orbiculatum* (Desv.) Rémy, in Gay, Hist. Fis. Pol. Chile, Bot. (Fl. Chilena) 6: 515. 1853 (as *Polystichum orbiculare* by Christ, Ark. f. Bot. 4[12]: 3. 1905).

Leaves ca. 15 cm to 1 m or more long. Petiole scales persistent or sparingly so; usually brown to

dark brown near the base and brown to whitish beyond; scales less than 1 cm long, rarely longer. **Lamina** 2-pinnate to 3-pinnate, or rarely small ones 1-pinnate-pinnatifid, ca. 2–25 cm broad; the apex lacking a bud, shortly acute to gradually reduced and attenuate. **Rachis** bearing a few to many brown to whitish scales, these broad or sometimes narrow and grading into fibrils. **Pinnae** mostly ascending, less often patent, the apex obtuse to less often subacute; basal pinnae somewhat reduced or not, mostly patent, sometimes ascending; pinnules plane (flat) or usually with revolute margins and apex.

The new names of Pteridophyta in Gay, Flora Chilena 6: 470–549 have been variously attributed to Gay, to Fée, to Rémy, to Fée & Rémy, and to Rémy & Fée. All of the new nomenclature is evidently to be attributed to Rémy (as Rémy, in Gay. Fl. Chil. 6:) and we have followed this citation. In his Cat. method. chron. public. A. L. A. Fée, 1863, Fée does not mention any contribution to the Flora Chilena of Gay, and in 1858, Sturm in Abhandl. natur.-hist. ges. Nürnberg 2: 151–202 (reprint 1–52) nine of the 11 new species are credited to Rémy. Looser in Rev. Universit. (Santiago, Chile) 15(7): 694–717. 1930, credits the treatments of pteridophytes to Rémy, although in later publications, on *Blechnum* for example, he cites species authors as Rémy & Fée. It seems that the original treatment was prepared by Rémy and that Fée had some editorial role with the manuscript.

Key to Varieties of *Polystichum orbiculatum*

- a. Lamina usually 2-pinnate, rarely 1-pinnate-pinnatifid or 3-pinnate only at the base of some pinnae 3a. var. *orbiculatum*
a. Lamina 3-pinnate well beyond the base of the pinnae 3b. var. *boboense*

3a. *Polystichum orbiculatum* var. *orbiculatum*

Aspidium orbiculatum Desv., Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk. 5: 321. 1811. TYPE: “*America australi*” (holotype, P!, Herb. Desvauz; photo, GH, US).
Nephrodium polyphyllum Presl, Reliq. haenk. 1: 37.

1825. TYPE: Peru, *Haenke* (holotype, PR! or PRC; photo, BM of PR).
Nephrodium trapezoides Presl, Reliq. haenk. 1: 37, t. 6, f. 1. 1825. TYPE: Peru, *Haenke* (holotype, PR or PRC?; isotype, K!).
Polypodium rigidum Hooker & Grev., Icon. fil. t. 163. 1830, not Lam. & DC. 1805. TYPE: “*Andium*

Peruvianorum" (Ecuador), Monte Pichincha, Jameson (holotype, K!).

Polystichum polyphyllum (Presl) Presl, Tent. pterid. 83. 1836.

Polystichum haenkeanum Presl, Tent. pterid. 83. 1836, nom. nov. for *Nephrodium trapezoides* Presl, not *Polystichum trapezoides* (Sw.) Presl, and with the same type.

Jamesonia paleacea Kunze, Bot. Zeit. 1844: 739, not *Polystichum paleaceum* (Borkh.) Schwarz, 1949. TYPE: Venezuela, Prov. Mérida (also "Caracas"), *Linden 505* (holotype, B; isotypes, E!, GH!, K!; photos, GH of BR and BM may be this species, or they and the holotype may be *P. pycnolepis*).

Polypodium saxatile Klotzsch, Linnaea 20: 383. 1847. TYPE: Peru, Herb. Ruiz 65 (holotype, B?). Hieronymus (Hedwigia, 46: 358. 1907) treats this as a variety of *Polystichum orbiculatum*.

Polypodium crenatodentatum Klotzsch, Linnaea 20: 384, 1847. TYPE: Peru, Ruiz 73 (holotype, B?). Hieronymus (*op. cit.*, p. 357) treats this as a variety of *Polystichum orbiculatum*.

Commonly growing in rocky, shaded places, at the edge of rocks, or on cliffs, on sandstone and on limestone, less often on grassy or shrubby hill-sides, or at high altitudes in the puna, 2700–4900 m, mostly 3200–4000 m, Lambayeque to Puno.

Southern Mexico; Costa Rica; Venezuela and Colombia south to Bolivia.

Polystichum orbiculatum is a highly variable species with most of the more distinctive variations included in var. *orbiculatum*. One extreme, especially characteristic of the puna, has erect leaves with strongly ascending pinnae that are closely set and the pinnules have strongly revolute margins. Another extreme has spreading leaves with mostly patent and spaced pinnae and the pinnules are flat. Another variation has the lamina relatively broad and the pinnae and pinnules sharply acute to acuminate. These all intergrade to an extent that implies they are variations within one taxon.

The label on *Soukup & Guillen 5386* (US): "Iquitos" (Loreto) is undoubtedly an error. The species grows at much higher altitudes than the ca. 100 m of Iquitos.

Lambayeque: 7 km NW of Incahuasi, *Sillon & Skillman 4110* (F, GH, UC). **Cajamarca:** Prov. Hualgayoc, cerca a Hualgayoc, *Ferreira 8539* (GH, USM). Prov. Conchucos, Casabamba, *Sagástegui et al. 10721* (F). **Amazonas:** NNE of Diosan, *Wurdack 1597* (F, GH, UC, US). **La Libertad:** Prov. Santiago de Chuco, above Cachicadán, *Stork & Horton 9976* (F, UC, US). Prov. Pataz, entre Retamas y La Paccha, *López & Sagástegui 3592* (GH). **San Martín:** Prov. Mariscal Cáceres, Río Abiseo National Park, *Young & León 4402* (F). **Ancash:** Prov. Pallasca, Conzuzo, *López 1165* (GH, US). Prov. Yungay, above Yungay, *Tryon & Tryon 6557* (F, GH). **Lima:** Between Parac and Tuncuyo, *Coronado 310* (GH, UC). Prov.

Huarochari, Mina Perdida, *Cerrate 2040* (USM). **Pasco:** Puna de Huaron, *Humbert 30894* (GH). Prov. Pasco, Huayllay, *Boeke 1086* (AAU, MO). **Junín:** Near Huancayo, *Killip & Smith 23363* (GH, US). Ca. 18 km SSE of Tarma, *Illis et al. 129* (GH, UC, US). **Huancavelica:** Prov. Huancavelica, westward from Huancavelica, *Stork & Horton 10851* (F, UC, US). Prov. Tayacaja, arriba de Toca, *Tovar 2018* (GH, USM). **Ayacucho:** Pumacuanca pass, *West 3658* (UC). Prov. Hanta, Ayacucho-Huanta, *Saunders 727* (GH). **Apurímac:** Bosques de Ampay, *Vargas 1061* (GH). **Cuzco:** Prov. Urubamba, Machu Picchu, *Peyton & Peyton 1055* (GH, MO). Prov. Espinar, Hacienda Chachachi, *Vargas 10812* (GH). **Arequipa:** Cailloma, *Müller & Müller 2151* (GH). **Puno:** Salcedo, *Soukup 275* (F, GH, UC). **Capachica Peninsula,** *Tutin 1071* (A, BM).

3b. *Polystichum orbiculatum* var. *boboense* (Hieron.) Tryon, comb. nov.

Polystichum boboense Hieron., Hedwigia 46: 358. t. 8, f. 25, 25a. 1907. TYPE: Ecuador, Río Bobo, near Tulcan, *Stübel 353*, in part (holotype, B).

Polystichum sodiroi Christ, Ark. f. Bot. 4(12): 4. 1905, TYPE: Ecuador, Quito, *Sodiro* (not located).

In ravines, 2800–3000 m, Piura.

Ecuador and Peru.

This variety is the most distinctive among the variations of *Polystichum orbiculatum*. The lamina is fully 3-pinnate and often the leaves are large, up to 1 mm or more long. Intermediates between the two varieties, with the lamina 3-pinnate only at or near the base of some pinnae, are present throughout most of the range of var. *orbiculatum*.

Piura: Prov. Huancabamba, above Huancabamba, *Hutchison 1608* (UC). Prov. Huancabamba, Huancabamba-Cuello del Indio, *Sagástegui et al. 8256* (F, UC; at MO this collection is toward var. *boboense*).

4. *Polystichum pycnolepis* (Klotzsch) Moore, Index fil. 92. 1858. Figure 13a.

Aspidium pycnolepis Klotzsch, Linnaea 20: 365. 1847. SYNTYPES: Venezuela, Mérida, Páramo de Culata, *Moritz 295*, *Moritz 296*; *Karsten "Coll. II, a, b"*. (B?); ISOSYNTYPES: *Moritz 295* (E!), (BM!, E!, K!; photo, GH of P), *Moritz s.n.* (GH!).

Aspidium gelidum Klotzsch, Linnaea 20: 365. 1847. TYPE: Venezuela, Mérida, Páramo de Culata, *Moritz 294* (holotype, B?; isotypes, BM, K!; photo, GH of BM).

Polypodium cochleatum Klotzsch, Linnaea 20: 388. 1847. TYPE: Peru, Ruiz 63 (holotype, B?).

Polystichum gelidum (Klotzsch) Fée, (Mém. foug. 5) Gen. fil. 278. 1852.

Polystichum cochleatum (Klotzsch) Hieron., Jahrb. Bot. Syst. 34: 452. 1904.

Leaves ca. 35 cm to 1 m long. **Petiole scales** more or less persistent, especially toward the base, dark brown to atropurpureous, or some light brown, often many ca. 2 cm long and to 1 cm broad. **Lamina** 2-pinnate, very rarely nearly 3-pinnate at the base of some pinnae, ca. 8–20 cm broad, rarely 5–7 cm broad; the apex lacking a bud, gradually to rather abruptly reduced. **Rachis** bearing usually very many brown fibrils and brown or darker, long, often involute or twisted, narrow scales, some lanceolate scales and broader ones usually also present. **Pinnae** patent to strongly ascending, the apex subacute to acuminate and deeply pinnatifid to the tip; basal pinnae reduced or not, usually ascending, sometimes patent or reflexed; pinnules with revolute to strongly revolute margins, the tip usually revolute.

Most commonly growing on open, rocky hill-sides, in rock crevices, and at the edge of large rocks, also on grassy or shrubby slopes and in heath lands, 1700 to usually 3000–4400 m, Amazonas to Puno.

Venezuela and Colombia south to Bolivia.

Aspidium pycnolepis is evidently the correct basionym, among those names proposed by Klotzsch in the same publication. *Aspidium gelidum* was reduced to *Phegopteris pycnolepis* by Mettenius (Abh. Senckenberg Naturf. Ges. 2; 295. 1858; Über einige Farngattungen, 4; 11. 1859) and *Polypodium cochleatum* (as *Phegopteris cochleata* Mett.) was reduced to *Polypodium pycnolepis* by Hooker (Sp. fil. 4: 248. 1862).

This species is characterized by dense, brown fibrils on the rachis and narrow, involute or twisted, usually brown or darker scales, especially toward the apex of the petiole and on the rachis. The usually large petiole scales are persistent.

Amazonas: Prov. Chachapoyas, Cerro Campanario, *Wurdack* 1589 (F, GH, UC, US). **La Libertad:** Between Huamachuco and Cajambamba, *Correll & Smith* P924 (GH). **Huánuco:** Tambo de Vaca, *Macbride* 4369 (F, GH, US). Mito, *Macbride & Featherstone* 1699 (F, US). **Apu- rimac:** Prov. Abancay, Dist. Abancay, *Saunders* 762 (GH). **Cuzco:** Prov. Calca, *Vargas* 15583 (GH). Prov. Urubamba, Chincheros, Taucsa, *Davis et al.* 1572 (F). **Puno:** Prov. Sandia, S of Limbani, *Metcalf* 30436 (F, GH, MO, UC, US). Prov. Huanacani, Occa Pampa, *Shepard* 74 (GH).

Comments

Polystichum muricatum (L.) Fée, (Mém foug. 5) Gen fil. 278. 1852.

Polypodium muricatum L., Sp. pl. 1093. 1753. TYPE: Haiti, Petiver, Pteri-graphia Amer., no. 53, t. 1, f. 6. 1712. (evidently a poor copy of Plumier, Traité foug. Amér. t. 39). *Polystichum moritzianum* (Klotzsch) Hieron., Hedwigia 46: 354. 1907.

This species has been commonly recorded from Peru; however, the collections are mostly either *P. platyphyllum* or *P. montevidense*. *Polystichum muricatum* is a species of Mexico and Central America, the Greater Antilles, and the northern part of South America.

It is characterized by large leaves, to 1 m or more long, attenuate pinnae that are deeply pinnatifid to the tip, flat pinnules, large, and brown or darker petiole scales that are often short-ciliate, and usually persistent well above the base, and especially by the rachis bearing only fibrils and very narrow scales, rather than some broad scales. The species is commonly indusiate, although Smith (1985) indicates that in Venezuela it is both indusiate and exindusiate.

XIV. Olfersia

Contributed by Robbin C. Moran

Olfersia Raddi, Opusc. Sci. 3: 283, t. 11b. 1819. TYPE: *Olfersia corcovadensis* Raddi = *O. cervina* (L.) Kunze. **Figure 14.**

Plants terrestrial or low-climbing. **Stem** short-creeping, in cross-section with the meristeles arranged irregularly and each one not surrounded by a dark sclerenchymatous sheath. **Sterile and fertile leaves** strongly dimorphic. **Sterile lamina** pinnate with a conform terminal pinna. **Veins** forking near or at the base, parallel, ca. 1 mm apart, connected by a submarginal vein (this sometimes difficult to see in dried material). **Fertile leaves** 2-pinnate, rarely 1-pinnate. **Sori** exindusiate, linear to oblong. **Spores** monolet, echinulate, ca. 50 microns long.

Olfersia is a monotypic genus that occurs from southern Mexico to southeastern Brazil and in the Antilles. It has been included in *Polybotrya* because of its strongly dimorphic leaves and creeping, scaly stem; however, *Olfersia* differs in stem anatomy, venation, and shape of the leaf apex.

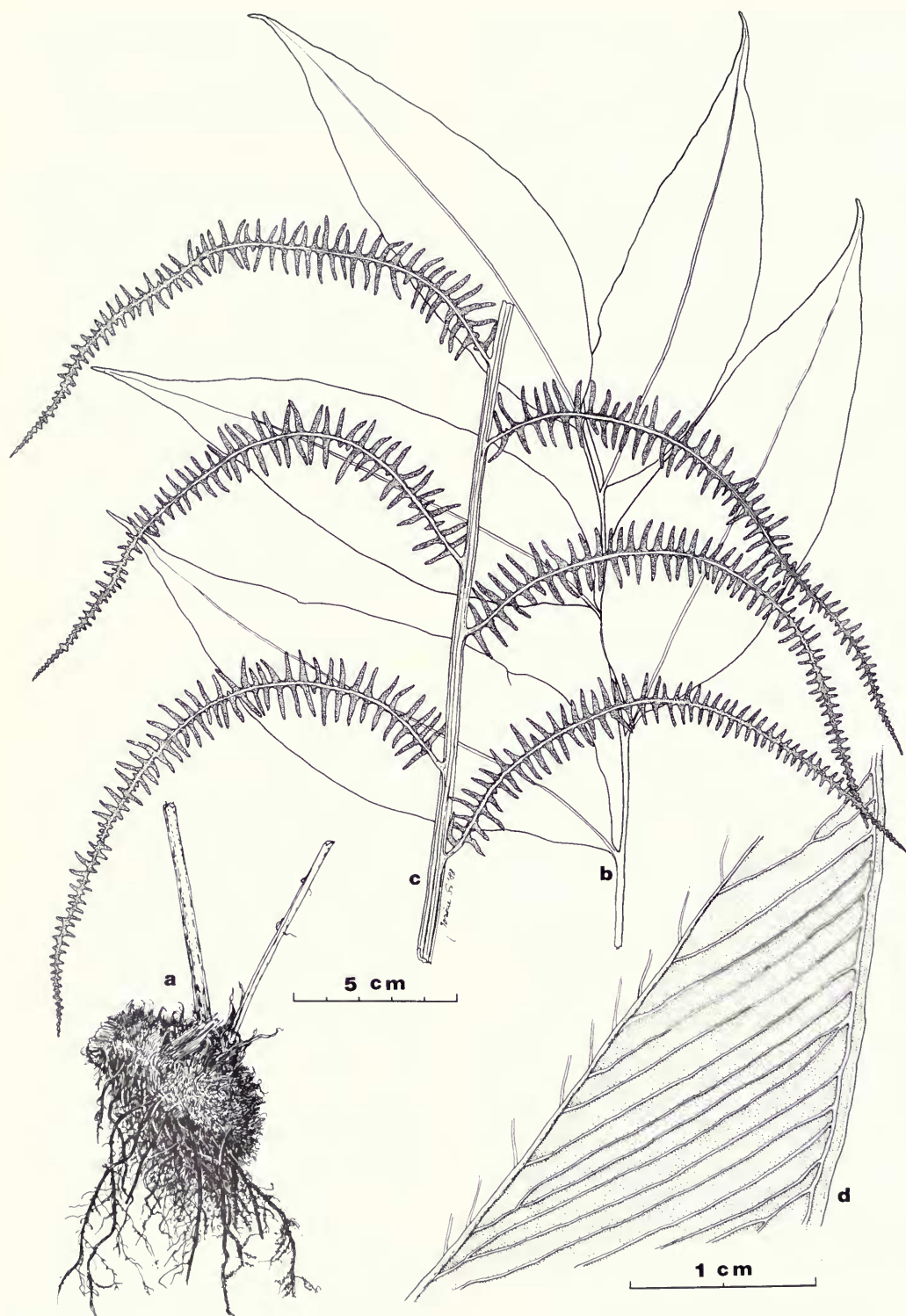


FIG. 14. *Olfersia cervina*: a, stem; b, apex of sterile leaf; c, portion of fertile leaf; d, portion of pinna, abaxial side. (a from Pabst 4771, Brazil, F; b, c from H. H. Smith 1075, Colombia, F; d from Madison et al, 4616, Ecuador, F.)

Reference

MORAN, R. C. 1986. The neotropical fern genus *Olfersia*. Amer. Fern. J., 76: 161–178.

1. *Olfersia cervina* (L.) Kunze, Flora 7: 312. 1824. **Figure 14.**

Osmunda cervina L., Sp. pl. 2: 1065. 1753. LECTO-TYPE (designated by Proctor, Flora Lesser Antilles 223. 1977): Plumier, Traité foug. Amér. t. 154. 1705, illustrating a plant from Martinique. *Olfersia corcovadensis* Raddi, Opusc. Sci. 3: 283, t. 11b. 1819. TYPE: Brazil, Rio de Janeiro, Mt. Corcovado, Raddi (holotype, presumably FI). *Polybotrya cervina* (L.) Kaulf., Enum. fil. 55. 1824.

Stem scales to 2.5 cm long and 0.1 cm broad, linear, golden-brown, entire. **Sterile leaves** 0.5–1.2 m long and 0.3–0.5 m broad, subcoriaceous, glabrous. **Petiole** shorter than the lamina, scaly at base. **Pinnæ** 15–30 cm long and 3–8 cm broad, ovate-lanceolate to lanceolate, 4–12 pairs, short-stalked, entire, the basiscopic side excavate. **Rachis and costae** not or only faintly grooved, glabrous. **Fertile leaves** produced freely on terrestrial as well as scandent stems, more erect than the sterile leaves and taller due to the longer petiole, soon withering after the spores are shed. **Petiole** 40–85 cm long. **Pinnæ** 7–20 cm long, subdistant. **Pinnules** 0.5–1 cm long and 0.1–0.3 cm broad, pectinately arranged, broadly adnate and joined by a narrow wing of tissue.

Shaded forests, ravines, swamps, mostly terrestrial or on dead logs, only occasionally climbing, 0–2000 m, Amazonas, Huánuco, Cuzco, Madre de Dios, Puno.

Entirely neotropical, West Indies; southern Mexico south to Bolivia and southeastern Brazil.

Amazonas: Prov. Bagua, 43 km by road NE of Chiriaco, Barbour 4514 (MO). **Huánuco:** Ridge E of Tingo María, Allard 22301 (GH, US). **Cuzco:** Prov. La Convención, Dudley 10324 (GH). **Madre de Dios:** Pantiacolla, serranía across Río Alto Madre de Dios from Shintuya, Gentry et al. 27366 (MO). **Puno:** Prov. Carabaya, Vargas 18936 (GH).

XV. Polybotrya

Contributed by Robbin C. Moran

Polybotrya Willd., Sp. pl., ed. 4, 5: 99. 1810. TYPE: *Polybotrya osmundacea* Willd. **Figure 15.**

Soromanes Fée, Mém. foug. 2: 16. 1845. TYPE: *Soromanes serratifolium* Fée = *Polybotrya serratifolia* (Fée) Klotzsch.

Plants hemiepiphytic or (in 2 species) terrestrial. **Stem** 1–3 cm thick, densely scaly, long-creeping in the hemiepiphytic species, short-creeping in the terrestrial ones, in cross-section with 4–10 circularly arranged meristeles, each surrounded by a dark sclerenchymatous sheath. **Sterile and fertile leaves** strongly dimorphic. **Sterile lamina** 1–4-pinnate, the apex pinnatifid or (in *P. polybotryoides*) subconform. **Veins** free or (in 4 of the 1-pinnate species) anastomosing. **Indusia** absent. **Sporangial capsules** glabrous or (in *P. pubens*) setose. **Spores** monolet, echinate.

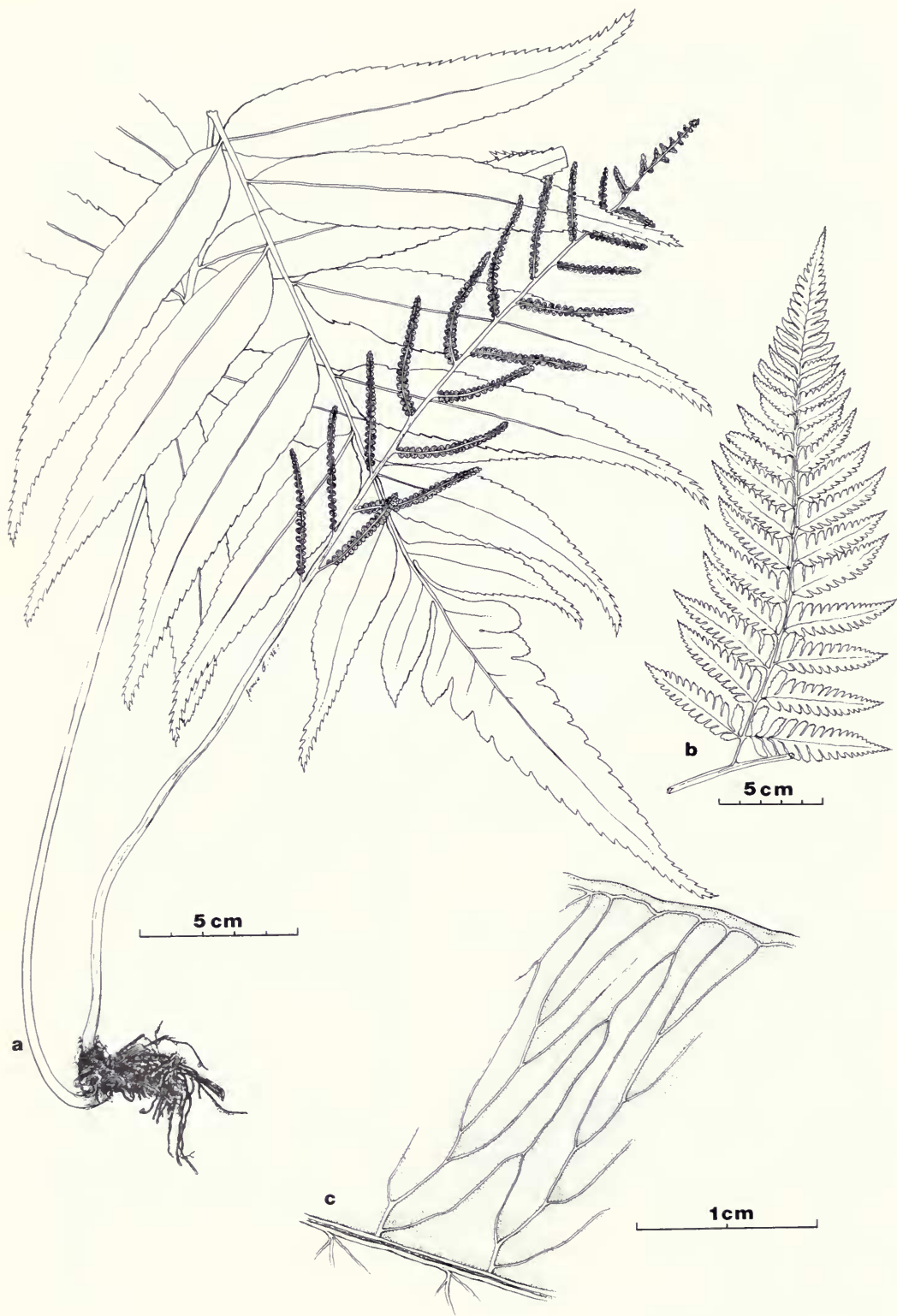
Polybotrya contains 35 species and is entirely neotropical, occurring from Mexico to southeastern Brazil and the West Indies. Its center of diversity is in the Andes, where 23 species occur, 12 of them in Peru, with four more expected there.

The genus is divided into three subgenera, all of them in Peru. Subgenus *Sorbifolia* Moran (1987a), type, *P. sorbifolia* Kuhn, is represented in Peru by species 1. *P. fractiserialis* and 2. *P. crassirhizoma*. Subgenus *Soromanes* (Fée) Moran (1987a), type, *P. serratifolia* (Fée) Klotzsch, is represented in Peru by 3. *P. polybotryoides*, 4. *P. suberecta*, and 5. *P. andina*. The other species, 6–16, belong to subgenus *Polybotrya*.

The genus is readily identified by its strong sterile-fertile leaf dimorphism, unique stem cross-section, and (in most species) hemiepiphytic habit.

References

- MORAN, R. C. 1987a. Monograph of the Neotropical fern genus *Polybotrya* (Dryopteridaceae). Bull. Illinois Nat. Hist. Surv., 34: 1–138.
- MORAN, R. C. 1987b. Sterile-fertile leaf dimorphism and evolution of soral types in *Polybotrya* (Dryopteridaceae). Syst. Bot., 12: 617–628.



Key to Species of *Polybotrya*

- a. Sterile lamina 1-pinnate b
 - b. Veins of sterile pinnae free (subgenus *Sorbifolia*) b
 - c. Plants terrestrial; stem scales brown, concolorous; fertile pinnules commonly round or oblong, usually less than 1 cm long 1. *P. fractiserialis*
 - c. Plants hemiepiphytic; stem scales orange or reddish brown, with a dark central stripe and lighter borders; fertile pinnules usually more than 1 cm long 2. *P. crassirhizoma*
 - b. Veins anastomosing (subgenus *Soromanes*) d
 - d. Lamina apex a terminal segment similar to the lateral pinnae 3. *P. polybotryoides*
 - d. Lamina apex gradually reduced, evenly pinnatifid, unlike the lateral pinnae e
 - e. Sterile lamina glabrous or rarely pubescent abaxially, the trichomes 0.1–0.3 mm long, colorless, erect, 1–3-celled; pinnae 4–5 cm broad, 6–13 pairs 4. *P. suberecta*
 - e. Sterile lamina densely pubescent abaxially, the trichomes 0.5–1.2 mm long, tawny, spreading, 5–12-celled; pinnae 5.7–10 cm broad, 4–7 pairs 5. *P. andina*
- a. Sterile lamina 1-pinnate-pinnatifid to 4-pinnate (subgenus *Polybotrya*) f
 - f. Pinnules of medial pinnae anadromous, i.e., the acroscopic pinnule is closest to the rachis g
 - g. Stem scales yellowish to dark golden brown, long, tortuous, and intricate; the basal basiscopic veinlet often arising between the main pinnate groups of veins 6. *P. altescandens*
 - g. Stem scales dark brown, rather straight, spreading or ascending; the basal basiscopic veinlet not arising between the main pinnate groups of veins 7. *P. osmundacea*
 - f. Pinnules of medial pinnae catadromous, i.e., the basiscopic pinnule is closest to the rachis .. h
 - h. Axes pilose, the trichomes 1–2.5 mm long, acicular i
 - i. Stem scales usually denticulate, translucent, cream-colored to castaneous; lamina broadest at the base or nearly so, the petiole more than 15 cm long; fertile pinnules caudate, 3–15 mm broad; sporangial capsules setose 8. *P. pubens*
 - i. Stem scales entire, opaque, dark brown; lamina base tapered to a short (less than 4 cm long) petiole; fertile pinnules 1–3 mm broad, botryoid; sporangial capsules glabrous 9. *P. glandulosa*
 - h. Axes glabrous or, if pubescent, the trichomes less than 1 mm long j
 - j. Tertiary segments or lobes of the sterile lamina 0.5–1.5 mm wide and with one vein 10. *P. lechleriana*
 - j. Tertiary segments or lobes of the sterile lamina more than 2 mm broad and with more than one vein k
 - k. Stem scales yellowish or dark golden brown, membranous, translucent, often long, tortuous and intricate, the margins erose to denticulate 1
 - 1. Lamina pubescent on both surfaces; veins prominulous adaxially 11. *P. puberulenta*
 - 1. Lamina glabrous on both surfaces; veins not prominulous m
 - m. Adaxial groove of costa pubescent within; basal basiscopic veinlet often arising between the main pinnate groups of veins; pinnae pinnatifid in the distal portion 6. *P. altescandens*
 - m. Adaxial groove of costa glabrous within; basal basiscopic veinlet arising from the costule; pinnae divided nearly to the apex 12. *P. aequatoriana*
 - k. Stem scales dull brown, thick, opaque, spreading to curved and ascending, the margins entire or nearly so n
 - n. Sterile lamina mostly 2-pinnate-pinnatifid; tertiary segments or lobes entire or nearly so o
 - o. Leaf margins sparsely and minutely ciliate; plants usually growing at 0–600 m 13. *P. caudata*

FIG. 15. *Polybotrya fractiserialis*: a, habit, fertile and sterile leaf. *Polybotrya osmundacea*: b, sterile pinna. *P. polybotryoides*: c, portion of pinna, abaxial side. (a from Irwin et al. 54784, Surinam, F; b from Schunke V. 5785, F; c from Moran 3593, Ecuador, F.)

- o. Leaf margins glabrous; plants growing at 1000–2100 m 14. **P. appressa**
- n. Sterile lamina mostly 3-pinnate-pinnatifid; tertiary segments lobed p
- p. Basal tertiary segments less than 2.5(–3) times longer than broad 15. **P. alfredii**
- p. Basal tertiary segments 3–6 times longer than broad q
- q. Costa evenly puberulent abaxially; groove of the costules on the adaxial side truncated by the ridges of the costal groove and therefore not decurrent, glabrous or nearly so within 16. **P. hickeyi**
- q. Costa glabrous or with only scattered trichomes abaxially; groove of the costules on the adaxial side decurrent into the groove of the costa, filled with reddish to brownish trichomes 7. **P. osmundacea**

1. **Polybotrya fractiserialis** (Baker) John Sm., Hist. fil. 133. 1875. Figure 15a.

Acrostichum fractiseriale Baker, Syn. fil. 414. 1868.
TYPE: Peru, San Martín, Mt. Campana, *Spruce* 4337 (holotype, K; color slide, MO of K; photos, GH, US of K).

Acrostichum plumbicaule Baker, Syn. fil. 413. 1868.
TYPE: Peru, San Martín, Tarapoto, *Spruce* 4090 (holotype, K; photo, GH; photo and frag., P!, US!).
Polybotrya plumbicaulis (Baker) John Sm., Hist. fil. 133. 1875.

Plants terrestrial. **Stem scales** dull brown, opaque, the margins entire or rarely denticulate. **Sterile lamina** 1-pinnate, glabrous. **Pinnæ** (11–)15–25(–28) cm long and (2.1–)2.5–4(–4.5) cm broad. **Axes** glabrous, or rarely with fine pubescence, the trichomes 0.1–0.2 mm long, adaxial grooves shallow, glabrous. **Veins** free. **Fertile lamina** 2-pinnate. **Pinnules** 1–3 mm broad, round, oblong or linear, pectinately arranged.

Wooded talus slopes, usually along rocky streams, 200–1500 m, Amazonas, San Martín and Loreto to Cuzco and Madre de Dios.

The range of *P. fractiserialis* consists of two widely separated regions, the eastern slopes of the Andes from Ecuador and Bolivia, and the Guianas.

Amazonas: Prov. Bagua, Valley of Río Marañón above Cascadas de Mayasi near Campamento Sta. Montenegro (Kms. 280–284 of Marañón road), *Wurdack* 1854 (US). **San Martín:** Prov. Lamas, between Tarapoto and Moyobamba, ca. 10 km NW of Tabalosas, *Croat* 51154 (MO). **Loreto:** Above Pongo de Manseriche, *Mexia* 6246a (UC, US). Aguaytía, *Croat* 21014 (MO). **Huánuco:** Prov. Huánuco, Tingo María, *Tryon & Tryon* 5221 (GH). Previsto, antes de Aguaytía, *Aguilar* 947 (USM). **Pasco:** Iscozacín, *Foster* 7937 (F, USM). Prov. Oxapampa, Palcazú, Río Alto Iscozacín, *Foster* 9996 (F). **Junín:** Prov. Satipo, Pichanaki, *León* 226 (USM). Chanchamayo Valley, C.

Schunke 165 (F, US). **Cuzco:** Prov. Paucartambo, *Vargas* 11280 (GH). **Madre de Dios:** Prov. Manú, town of Atalaya, 2–3 km W of village, *Foster* 7455 (F, MO, USM). Pantiacolla, serranía across Río Alto Madre de Dios from Shintuya, *Gentry et al.* 27365 (MO). Valle de Marcapata, *Herrera* 1200 (US).

2. **Polybotrya crassirhizoma** Lellinger, Amer. Fern J. 62: 49, f. 1, 8. 1972. TYPE: Peru, Loreto, Gamitanacocha, Río Mazán, *J. Schunke* 268 (holotype, US!; isotypes, F!, GH!, NY!, UC!).

Polybotrya macbridei Lellinger, Amer. Fern J. 62: 51, f. 2, 9. 1972. TYPE: Peru, Junín, *Schunke* Hacienda, La Merced, *Macbride* 5602 (holotype, US!; isotype, F!).

Plants hemiepiphytic. **Stem scales** dull orange or reddish brown, rarely shiny and dark brown, with a dark central stripe and lighter borders, the margins denticulate to erose. **Sterile lamina** 1-pinnate, lanceolate, glabrous. **Pinnæ** (11–)15–20(–24) cm long and 2–4 cm broad, the margins crenate to dentate. **Axes** sparsely scaly and pubescent, the trichomes ca. 0.1 mm long, colorless, subulate, adaxial grooves glabrous within. **Veins** free, often with a single basiscopic veinlet arising from the costa between the main 1-pinnate groups. **Fertile lamina** 2-pinnate, occasionally 2-pinnate-pinnatifid in large leaves. **Pinnules** 1–3 mm broad, oblong to linear, pectinately arranged.

Wet forests, 100–1500 m, Loreto, Huánuco, Pasco, and Junín.

Colombia to Bolivia and western Brazil; most frequent and abundant in Amazonia, but also on the eastern slopes of the Andes.

Loreto: Prov. Maynas, Quebrada Yanomona, Explorama tourist camp, Río Amazonas above the mouth of

Río Napo, *Moran* 3640, 3641 (F, Q, QCA). **Huánuco:** Prov. Pachitea, Río Pozuzo, *Foster* 9284 (F, MO, USM). **Pasco:** Prov. Paucartambo, Cosñipata Valley, Río Tono, road N of Patria to first foothill ridge, *Foster* 10627 (F). **Junín:** Chanchamayo Valley, C. *Schunke* 157, 158 (F). *Schunke* Hacienda, above San Ramón, *Killip & Smith* 24605 (NY, US).

3. **Polybotrya polybotryoides** (Baker) Christ, Bull. Herb. Boissier, ser. 2, 1: 70. 1901. **Figure 15c.**

Acrostichum polybotryoides Baker, J. Bot. 19: 207. 1881. TYPE: Colombia, Norte de Santander, Ocaña, *Kalbreyer* 1254 (holotype, κ ; color slide, MO of κ ; photos, GH, MO of κ).

Acrostichum juglandifolium Baker, J. Bot. 19: 207. 1881, *nom. illeg.*, not Kaulfuss, 1824. TYPE: Colombia, Antioquia, *Kalbreyer* 1798 (holotype, κ ; color slide, MO of κ ; photos, GH, MO of κ).

Polybotrya juglandifolia Christ, Bull. Herb. Boissier, ser. 2, 4: 965. 1905. *nom. nov.* for *Acrostichum juglandifolium* Baker, and with the same type.

Polybotrya kalbreyeri C. Chr., Index fil. 504. 1906. *nom. superfl.* for *Polybotrya juglandifolia* Christ.

Plants hemiepiphytic. **Stem scales** lustrous, golden yellow when fresh, turning yellow-brown to purple-brown upon drying, ascending with spreading tips, the margins denticulate. **Sterile lamina** 1-pinnate, the tissue between the veins glabrous on both surfaces. **Pinnæ** 12–20(–30) cm long and 3–6(–8) cm broad, 5–12 pairs, the margins entire, crenate or broadly serrate. **Axes** glabrous or nearly so, adaxial grooves glabrous within. **Veins** anastomosing, the tips connected by a faint intramarginal connecting strand. **Fertile leaves** 2-pinnate. **Pinnules** linear, entire or lobed toward the base.

Wet forests, 0–1400(–1850) m, Huánuco, Pasco. Southern Mexico to Central Peru.

Huánuco: SW slope of Río Lullapichis watershed, ascent of Cerros del Sira, *Dudley* 13290D (GH). **Pasco:** Prov. Oxapampa, Abra los Mellizos, 4–8 km from Eneñas, *Skog et al.* 5036 (us).

4. **Polybotrya suberecta** (Baker) C. Chr., Index fil. 506. 1906.

Acrostichum suberectum Baker, J. Bot. 19: 207. 1881. TYPE: Colombia, Antioquia, *Kalbreyer* 1877 (holotype, κ ; color slide, MO of κ ; photos, GH, US of κ).

Acrostichum hackelianum Sodiro, Crypt Vasc. Quit. 491. 1893. TYPE: Ecuador, Pichincha, banks of the Río Pilaton, *Sodiro* (holotype, $q!$).

Plants hemiepiphytic. **Stem scales** dark brown, linear, stiff and ascending to spreading, denticulate. **Sterile lamina** 1-pinnate, glabrous or rarely with uncinat trichomes abaxially. **Pinnæ** (10–)15–21(–25) cm long and (3–)4–5(–6.5) cm broad, 6–13 pairs, the margins entire or shallowly serrate. **Axes** glabrous or rarely pubescent, the trichomes less than 0.1 mm long, uncinat, the adaxial grooves glabrous within. **Veins** anastomosing, the tips occasionally uniting to form a discontinuous submarginal strand. **Fertile leaves** 2-pinnate to 2-pinnate-pinnatifid. **Pinnules** linear, entire, or lobed at the base, pectinately arranged.

Wet forests, 600–1800 m, Junín. Colombia to Peru.

Junín: Prov. Tarma, Chanchamayo, *Esposto* 10928 (USM).

5. **Polybotrya andina** C. Chr., Index fil. 504. 1906. *nom. nov.* for *Acrostichum insigne* Baker, not Fée, 1872–73, and with the same type.

Acrostichum insigne Baker, J. Bot. 15: 167. 1877, *nom. illeg.*, not Fée, 1872–1873. TYPE: Ecuador, Pichincha, “Andes of Quito,” *Sodiro* (holotype, κ ; photo, GH, US of κ ; isotypes, AAU!, GH!, $q!$, UC!).

Plants hemiepiphytic. **Stem scales** dark castaneous, linear, shiny or dull, opaque, denticulate. **Sterile lamina** 1-pinnate, the apex pinnatifid, pubescent abaxially, the trichomes spreading, tawny, uncinat, 4–10-celled. **Pinnæ** 17–33 cm long and 5.7–10 cm broad, 4–7 pairs, the margins entire. **Axes** pubescent, the adaxial grooves glabrous. **Veins** anastomosing. **Fertile lamina** 2-pinnate. **Pinnules** linear, pectinately arranged, entire to lobulate.

Wet forests, 1000–1200 m, not known from Peru but expected to occur there. Ecuador.

6. **Polybotrya altescandens** C. Chr., Index fil. 7. 1905, *nom. nov.* for *Acrostichum chrysolepis* Sodiro, not Fée, 1869, and with the same type.

Acrostichum chrysolepis Sodiro, Crypt vasc. Quit. 485. 1893, *nom. illeg.*, (not Fée, 1869). TYPE: Ecuador, Pichincha, “ad Pilaton-Toachi,” *Sodiro* (holotype, $p!$).

Plants hemiepiphytic. **Stem scales** yellow to dark golden brown, linear, mostly concolorous, shiny, long, tortuous and intricate, denticulate, the base cordate and darkened around point of attachment. **Sterile lamina** to 2-pinnate-pinnatifid or rarely 3-pinnate at the base, lanceolate, glabrous. **Pinnae** 14–25(–35) cm long and 3–10(–17) cm broad, not deeply cut, pinnatifid above the base in the distal portions. **Pinnules** of the medial pinnae 6–10 cm long and 1–3.5 cm broad, catadromous, sessile. **Axes** pubescent and sparsely scaly abaxially, the trichomes 0.1–0.2 mm long, erect, the scales scattered, denticulate, adaxial grooves slightly pubescent within. **Veins** free, with the basal basiscopic veinlet often arising between the main pinnate groups of veins. **Fertile lamina** 3-pinnate. **Pinnules** narrowly oblong to linear, pinnate, with the sori obovate or oblong.

Wet forests, (800–)1200–2500 m, Loreto, Huánuco.

Colombia; Ecuador; Peru.

Loreto: Prov. Coronel Portillo, Dist. Padre Abad, divisoria cerca al Río Chino, *J. Schunke* 10200 (MO). **Huánuco:** La Divisoria, ca. 25 km NE of Tingo María, *Moran* 3688 (F, G, GH, MO, USM).

7. *Polybotrya osmundacea* Willd., Sp. pl. ed. 4, 5: 99. 1810. TYPE: Venezuela, Monagas, Caripe, *Humboldt* 459a (fertile), 459b (sterile) (holotype, B, Herb. Willd. 19507-1, 19507-2; photos, F, GH). **Figure 15b.**

Acrostichum osmundaceum (Willd.) Hooker, Sp. fil. 5: 246. 1864.

Plants hemiepiphytic. **Stem scales** variable, with plants from Amazonia tending to have thick, opaque, dark brown, subentire, somewhat squarrose scales and plants from elsewhere tending to have shiny, ascending, spreading scales, often with a dark central stripe and lighter borders, margins erose to denticulate. **Sterile lamina** 2-pinnate-pinnatifid to 3-pinnate-pinnatifid, deltate, ovate, or lanceolate, the tissue between the veins glabrous or rarely glandular, the glands round, sessile, resinous, the margins glabrous. **Pinnae** 20–50 cm long and 10–25 cm broad, anadromous, deeply cut to the apex. **Pinnules** of the medial pinnae to 14 cm long and 4 cm broad, anadromous, or sometimes in plants from Amazonia, catadromous, the base prolonged acroscopically, stalked, the stalk 1–5 mm long. **Tertiary segments** lobed. **Axes** glabrous

or pubescent abaxially, the trichomes 0.2–0.5 mm long, whitish, the scales absent or few and inconspicuous, adaxial grooves pubescent within. **Veins** free. **Fertile lamina** to 3-pinnate-pinnatifid. **Pinnules** lanceolate, pinnate.

Wet forests, 0–2100 m, San Martín and Loreto to Cuzco and Madre de Dios.

One of the most common and widespread species of *Polybotrya*, from Guatemala to French Guiana, Bolivia and northern Brazil; Antilles.

San Martín: Camino a Pushurumbo, 7–8 km E del puente de Palo Blanco, Mariscal Cáceres, Tocache Nuevo, *J. Schunke* 5785 (COL, NY, US). **Loreto:** Prov. Maynas, Peter Jensen's Explorama Lodge, 50 mi downriver from Iquitos, *Moran* 3642 (AMAZ, F, USM). **Huánuco:** Tingo María, *Allard* 21609, 21997 (US). **Pasco:** Pichis Trail, Yapas, *Killip & Smith* 25452 (NY, US). Prov. Oxapampa, Palcazú, Río Alto Iscozacín, Ozuz, *Foster* 9994 (F). **Junín:** E of Quimiri bridge, near La Merced, *Killip & Smith* 23991 (F, NY, US). **Ucayali:** Río Aguaytía above mouth of Quebrada Yurac-Yacu, *Croat* 20851 (MO). **Cuzco:** Prov. Paucartambo, arriba de Tono, cerca de Patria, *Fernández et al.* 1013 (F). **Madre de Dios:** Prov. Manú, *Vargas* 17743 (GH).

8. *Polybotrya pubens* Mart., Icon. pl. crypt. 87, t. 25. 1834. LECTOTYPE (designated here): Brazil, ad flum. Amazonas prope Serpa, *Martius* (holotype, M!).

Polybotrya pubens Kunze, Linnaea 9: 22. 1834, not Martius, 1834. TYPE: Peru, Loreto, Prov. Maynas, ad Yurimaguas, *Poeppig* (holotype, P!), one of the syntypes of *P. pubens* Mart.).

Polybotrya decorata Lellinger, Amer. Fern J. 62: 54, f. 5, 6, 11. 1972. TYPE: Peru, Loreto, Iquitos, *Killip & Smith* 26955 (holotype, US!; isotype, NY!).

Plants hemiepiphytic. **Stem scales** variable, on large mature stems whitish to coffee-brown, concolorous, ovate, membranous, denticulate, or on young or terrestrial stems narrowly lanceolate, castaneous. **Sterile lamina** mostly 1-pinnate-pinnatifid, the base occasionally 2-pinnate-pinnatifid, pubescent throughout or rarely glabrous adaxially, the trichomes 1–2 mm long, acicular, whitish. **Pinnae** 9–19 cm long and 2.5–3.5 cm broad, often with the lowest pinnae having a few free proximal segments or pinnules. **Pinnules or segments** catadromous, oblong, slightly falcate. **Veins** free. **Axes** conspicuously pubescent, adaxial grooves pubescent. **Fertile lamina** mostly 1-pinnate-pinnatifid, sometimes 2-pinnate at base. **Pinnae** mostly entire, long-caudate. **Sporangial capsules** setose.

Wet forests, primarily in Amazonia, 0–1400 m, Amazonas, San Martín, Loreto, Pasco, Junín, Madre de Dios.

Colombia to Bolivia; western Brazil.

This species is characterized by its relatively uncut lamina, long, dense, whitish pubescence, and long-caudate fertile pinnae. In addition, it is the only species of *Polybotrya* with setose sporangial capsules. The name *Polybotrya pubens* was published twice in the same year. The name of Martius is accepted as correct, since Kunze took his name from a specimen annotated by Martius.

Amazonas: Ridge crest of Quebrada Chuivi (above Km 278 of Marañón road), valley of Río Marañón, near Cascadas de Mayasi, *Wurdack 1933* (us). **San Martín:** Monte Campana, *Spruce 4740* (photo, GH, us). Camino a Pushurumbo, 7–8 km E del Puente de Palo Blanco, Mariscal Cáceres, Tocache Nuevo, *J. Schunke 5789* (NY, us). **Loreto:** Above Tamishuyacu, *Croat 19771* (AMAZ, MO). **Pasco:** Prov. Oxapampa, Iscozacín, *Foster 7858* (F, USM). **Junín:** E of Quimiri bridge, near La Merced, *Killip & Smith 23196* (NY, us). Puerto Bermúdez, *Killip & Smith 26543* (NY, us). **Madre de Dios:** Prov. Manú, Cerro de Pantiacolla, Río Palotoa, 10–15 km NNW of Shintuya, *Foster 10821* (F).

9. ***Polybotrya glandulosa*** Kuhn, *Linnaea* 36: 65. 1869. TYPE: Brazil, Amazonas, San Gabriel, *Spruce* (holotype, B!).

Polybotrya subelliptica Lellinger, *Amer. Fern J.* 62: 56. 1972. TYPE: Peru, Loreto, Mishuyacu, near Iquitos, *Klug 1390* (holotype; us!; isotypes, F!, NY!).

Plants hemiepiphytic. **Stem scales** dull brown, thick, opaque, concolorous to bicolorous, curved-appressed, the margins entire, the base expanded, the dorsal surface sometimes with a medial groove. **Sterile lamina** 2-pinnate-pinnatifid, subelliptic, gradually tapered to a short, less than 4 cm long, petiole, pilose on both surfaces. **Pinnae** 14–16 cm long and 3–3.5(–4) cm broad, sessile or nearly so. **Pinnules** of the medial pinnae 15–20 cm long and 5–7 cm broad, catadromous, crenate or lobed. **Axes** pilose, the trichomes 1–2.5 mm long, whitish, acicular, adaxial grooves pilose. **Veins** free. **Fertile lamina** 2-pinnate-pinnatifid, botryoid.

Wet lowland forests, 100 m, Loreto.

Southern Venezuela; northeastern Peru; northwestern Brazil.

This species is known from only three collections (in Peru only from the type of *P. subelliptica*) and is apparently endemic to the northeastern

Amazon basin. It is easily recognized by its lamina, which gradually tapers to a short, less than 4 cm long, petiole, and the long-pilose pubescence.

10. ***Polybotrya lechleriana*** Mett., *Fil. lechl.* 1: 1: 4. t. 1, f. 1–5. 1854. TYPE: Peru, Puno, San Gabán, *Lechler 2156* (holotype, LZ destroyed; isotypes, B!, K, L!; frag., F!, us!; photo, GH of K!).

Acrostichum lechlerianum (Mett.) Hooker, *Sp. fil.* 5: 246. 1864, *nom. illeg.* (not Mettenius, 1856).

Plants hemiepiphytic. **Stem scales** lanceolate, cream to dull brown, thin, appressed, the margins denticulate to entire. **Sterile lamina** 3–4 pinnate, lanceolate to elliptic, pubescent on both surfaces and especially so along the veins. **Pinnae** (7–)10–15 cm long and (2–)3–7(–12) cm broad, deeply and finely cut to the apex. **Pinnules** of the medial pinnae 1.5–5 cm long and 1–2 cm broad, sessile or nearly so. **Ultimate segments** 0.5–1 mm broad, single-veined, falcate. **Axes** pubescent, the junctures often provided with a brown, ovate scale, adaxial grooves pubescent or glabrous. **Fertile lamina** 3–4-pinnate. **Pinnules** oblong, botryoid.

Wet forests, (100–)1000–1500 m, San Martín, Junín, Cuzco, Puno.

Colombia to Bolivia; Guyana (Mt. Roraima).

This species has the most finely divided lamina of any in *Polybotrya*. The narrow, 1-nerved ultimate segments readily distinguish the species.

San Martín: Mt. Guayrapurima, near Tarapoto, *Spruce 4744* (L, P, frag., us). **Junín:** Prov. Satipo, Mapiri, ca. 12 km SW of Chequitavo, *Smith 61713* (MO, USM). **Cuzco:** Prov. La Convención, Cordillera Vilcabamba, Camp 2.5, *Dudley 10325* (GH). **Puno:** La Pampa, Río Tavera, *Watkins* (us).

11. ***Polybotrya puberulenta*** R. C. Moran, *Bull. Illinois Nat. Hist. Surv.* 34: 90, f. 41. 1987. TYPE: Ecuador, Napo, Cordillera Oriental, camino Baeza-Tena, 5 km S de Cosanga, *Morran 3528* (holotype, F!; isotypes, COL!, GH!, LPB!, MO!, NY!, Q!, QCA!, UC!, us!, VEN!).

Plants hemiepiphytic. **Stem scales** yellow to sor-did orange, darker in the center with light yellow borders, membranous, spreading, erose to denticulate. **Sterile lamina** to 2-pinnate-pinnatisect, del-tate to broadly ovate, puberulent on both surfaces,

the trichomes ca. 0.1 mm long, spreading. **Pinnæ** to 34 cm long and 18 cm broad, deeply cut to the apex. **Pinnules** of the medial pinnæ to 10 cm long and 3 cm broad, catadromous, the basiscopic margin thickened, decurrent on the costa. **Axes** puberulent, adaxial grooves pubescent within. **Veins** free, prominulous adaxially. **Fertile leaves** 4-pinnate. **Pinnules** lanceolate, pinnate, botryoid.

Wet forests, 1100–1500 m, not known from Peru but expected to occur there.

Ecuador; Bolivia.

12. **Polybotrya aequatoriana** R. C. Moran, Bull. Illinois Nat. Hist. Surv. 34: 94, f. 43. 1987. TYPE: Ecuador, Napo, Cordillera Oriental, camino Baeza-Tena, 34 km S de Baeza, *Morran 3512* (holotype; F!; isotypes, AAU!, COL!, GH!, LPB!, MO!, NY!, Q!, QCA!, UC!).

Plants hemiepiphytic. **Stem scales** yellowish orange, membranous, long, tortuous and intricate, the margins minutely denticulate. **Sterile lamina** 2-pinnate-pinnatifid, lanceolate, moderately to slightly pubescent below and often glandular, the trichomes 0.1–0.3 mm long, fine, appressed, the glands resinous, round. **Pinnæ** 25–35 cm long and 13–18(–20) cm broad, divided nearly to the apex, prolonged acroscopically, catadromous, the base stalked, the stalk 1–3 mm long, the margins slightly thickened and lighter colored, often revolute upon drying. **Axes** pubescent and scaly below, the trichomes 0.1–0.2 mm long, erect, the scales linear, flexuous, dark, often appressed, adaxial grooves pubescent within. **Veins** free, the basal basiscopic veinlet arising from the costule. **Fertile leaves** 3-pinnate. **Pinnules** linear, pinnate, botryoid.

Cloud forests, 2100–2400 m, not known from Peru but expected to occur there.

Ecuador; Bolivia.

13. **Polybotrya caudata** Kunze, Linnaea 9: 23. 1834. TYPE: Peru, Huánuco, Pampayacu, *Poeppig* (B!).

Olfersia caudata (Kunze) Kunze, Linnaea 21: 206. 1848.

Acrostichum caudatum (Kunze) Hooker, Sp. fil. 5: 244. 1864, *nom. illeg.*, not Hooker, 1840.

Plants hemiepiphytic. **Stem scales** dull brown, opaque, appressed, entire, the base elevated, thick-

ened, curved. **Sterile lamina** 2-pinnate-pinnatifid (rarely 3-pinnate at the base), ovate to lanceolate, the tissue between the veins pubescent or (rarely) glabrous, the trichomes 0.2–1.5 mm long, acicular, the margins minutely and sparsely ciliate. **Pinnæ** up to 20–45 (–60) cm long and 7–20(–30) cm broad. **Pinnules** of medial pinnæ 7–15 cm long and 1–3 cm broad, catadromous, the base slightly prolonged acroscopically. **Tertiary segments or lobes** entire or nearly so. **Axes** glabrous or pubescent to various degrees, the trichomes 0.2–1.5 mm long, acicular, whitish, adaxial grooves usually pubescent within, often densely so at the junctures. **Veins** free. **Fertile lamina** 2-pinnate. **Pinnules** 0.4–1 cm broad, linear-caudate, entire or lobed at the base.

Wet forests, 0–1900 m, Amazonas and Loreto to Cuzco and Puno.

Eastern and southern Mexico to French Guiana, northern Brazil and Bolivia.

Amazonas: Prov. Bagua, left bank of Río Marañón opposite Quebrada Mirana (opposite Km 277 of Marañón road above Cascadas de Mayasi), *Wurdack 2011* (GH, US, USM). **San Martín:** San Roque, *Ll. Williams 7681* (F, US). **Loreto:** Prov. Maynas, Peter Jensen's Explorama Lodge, 50 mi downriver from Iquitos at Yanomona Ck. *Moran 3663* (AMAZ, USM). **Huánuco:** 10 km S of Tingo María, *Stork & Horton 9509* (F, UC, US). **Pasco:** Puerto Bermúdez, *Killip & Smith 26637* (NY, US). **Madre de Dios:** Parque Nacional de Manú, Cocha Cashu Biological Station, *M. Foster P-84-42* (F). Prov. Manú, Cerro de Pantiacolla, Río Palotoa, 5–10 km NNW of Shintuya, Palotoa Control Post, *Foster et al. 11045* (F). **Cuzco:** Prov. La Convención, at Camp Zero, *Dudley 11513* (GH, US). **Puno:** San Gabán, *Lechler 2321, 2329* (B).

14. **Polybotrya appressa** R. C. Moran, Bull. Illinois Nat. Hist. Surv. 34: 94, f. 44. 1987. TYPE: Ecuador, Napo, Cordillera Oriental, camino Baeza-Tena, 34 km al sur de Baeza, *Moran 3586* (holotype, F!; isotypes, GH!, MO!, NY!, Q!, QCA!, US!).

Plants hemiepiphytic. **Stem scales** dull brown, thick, opaque, entire, appressed or curved and ascending. **Sterile lamina** mostly 2-pinnate-pinnatifid, dark green adaxially, lighter below, both surfaces and the margins glabrous. **Pinnæ** to 37 cm long and 18 cm broad. **Pinnules** of the medial pinnæ catadromous, the base prolonged acroscopically, stalked, the stalk 1–5 mm long. **Tertiary segments** entire or nearly so. **Axes** evenly pubescent abaxially, the trichomes less than 0.1 mm long, the scales absent or few and inconspicuous,

linear to lanceolate, appressed, light brown, adaxial grooves sparsely pubescent within. **Veins** free. **Fertile lamina** unknown.

Cloud forests, 1000–2250 m, Cajamarca, Ecuador and Peru.

Cajamarca: Lower edge of Cutervo National Park, 10–15 km N of San Andres de Cutervo, *Gentry et al. 61498* (MO).

15. **Polybotrya alfredii** Brade, *Bradea* 1: 12, t. 1, f. 2. 1969. TYPE: Costa Rica, Prov. San José, Tablazo, *Brade & Brade 98* (holotype, HB; isotype, NY!).

Plants hemiepiphytic. **Stem scales** dull brown, opaque to translucent, spreading, the margins denticulate or more, commonly entire. **Sterile lamina** 2-pinnate-pinnatifid to 4-pinnate, ovate, the tissue between the veins glabrous. **Pinnæ** (15–)20–45 cm long and 10–22 cm broad, deeply cut to the apex. **Pinnules** of the medial pinnæ up to 12 cm long and 5 cm broad, catadromous, the base stalked, the stalk 1–3 mm long. **Tertiary segments** lobed. **Axes** pubescent abaxially, the trichomes 0.1–0.2 mm long, usually tawny, adaxial grooves pubescent within. **Veins** free. **Fertile leaves** 3-pinnate-pinnatifid. **Pinnules** lanceolate, pinnate.

Wet forests, 700–1900 m, Huánuco, Costa Rica to Bolivia.

A thick mucilage often invests the petiole bases and distal portion of the stem. This mucilage disappears after drying and leaves no vestige of its former presence.

Huánuco: SW slope of the Río Lullapichis watershed on the ascent of Cerro del Sira, *Dudley 13258, 18265A* (GH).

16. **Polybotrya hickeyi** R. C. Moran, *Bull. Illinois Nat. Hist. Surv.* 34: 88, f. 40. 1987. TYPE: Bolivia, Cochabamba, Prov. Chapare, road from Cochabamba to Villa Tunari, *Hickey 801* (holotype, GH!; isotype, MU).

Plants hemiepiphytic. **Stem scales** dark chocolate-brown, mostly opaque, concolorous, or the apex with thinner, lighter borders, the margins denticulate to entire, the base thickened, attached across its full width. **Sterile lamina** to 3-pinnate-pinnatifid, deltate, the abaxial surface slightly pu-

berulent, the trichomes up to 0.1 mm long, cylindrical, appressed. **Pinnæ** to 46 cm long and 25 cm broad, deeply cut to the apex. **Pinnules** of the medial pinnæ 5–10 cm long and 2–4 cm broad, catadromous, the base slightly prolonged acroscopically, the basiscopic margins thickened and decurrent on the costa. **Tertiary segments** lobed. **Axes** puberulent and scaly, the trichomes ca. 0.1 mm (?) long, erect, the scales appressed, denticulate, flexuose, adaxial groove glabrous or nearly so within, not prominent. **Fertile lamina** 4-pinnate. **Pinnules** lanceolate to oblong, pinnate, botryoid.

Wet forests, 1700–2400 m, Pasco, Colombia; Peru; Bolivia.

Pasco: Prov. Oxapampa, Canyon de Huanca-bamba, *León 622* (GH).

Comments

Polybotrya fulvastrigosa Christ, *Bull. Herb. Boissier*, ser. 2, 1: 70. 1901. TYPE: Peru, Loreto, Cerro de Canchahuaya, *Huber 1448*.

I have not seen the type and am uncertain from the description to what species this name belongs.

Polybotrya lomarioides Mett., *Fil. lechl.* 2: 5. 1858. TYPE: Peru, Puno, San Gabán, *Lechler*.

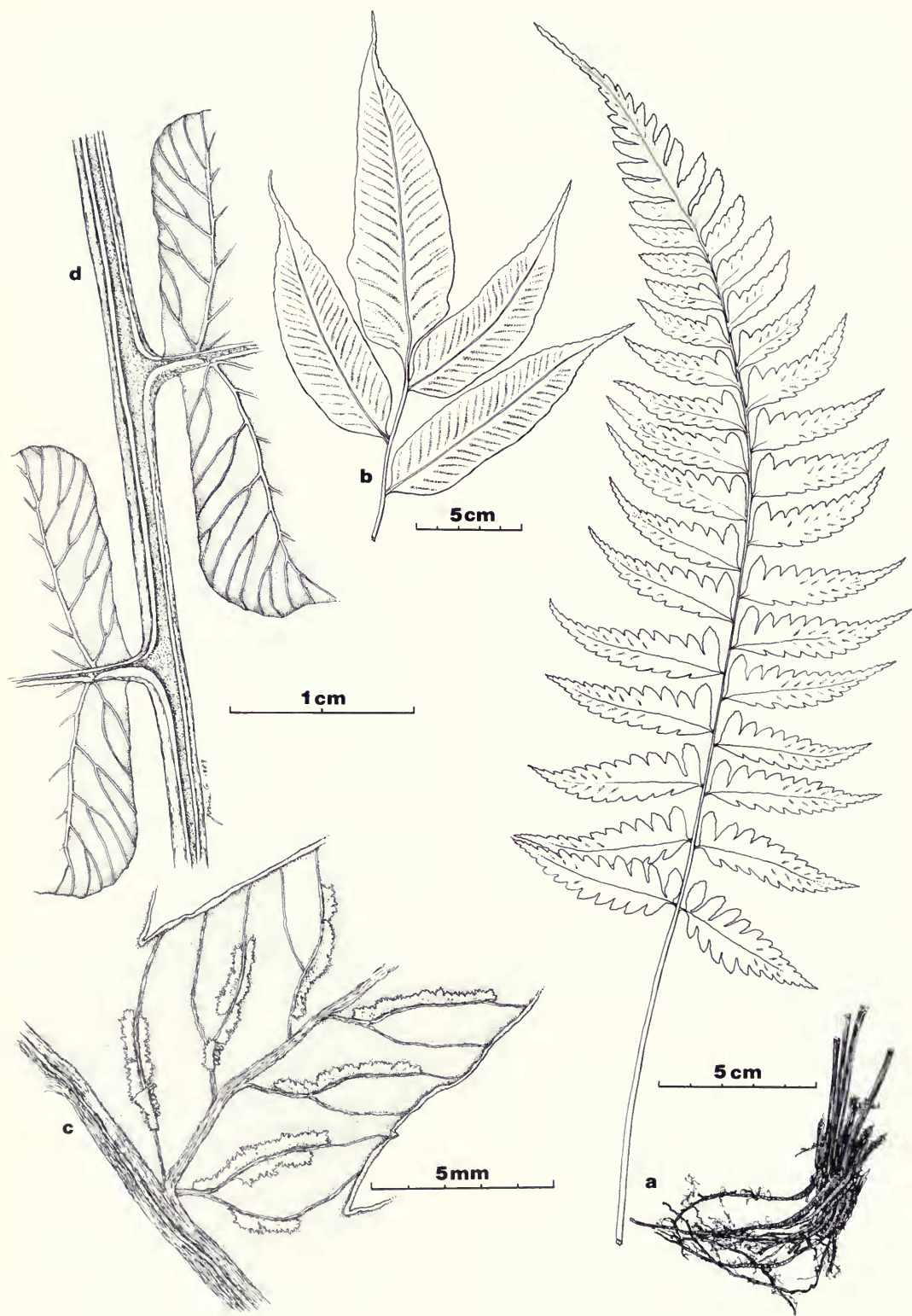
I have not seen the type and am uncertain from the description if this name applies to a species of *Polybotrya* or to another genus.

Polybotrya nutans Kunze, *Linnaea* 9: 24. 1834. TYPE: Peru, “Sylvæ flor. Peruv. ad Pampayaco . . .,” *Poeppig*, in July 1829 (B!, P!).

The fertile leaf of the type specimen is a *Polybotrya*, but I do not know which species. The sterile leaf of the type specimen is a tree fern, perhaps a species of *Trichipteris*.

XVI. Diplazium

Diplazium Sw., *J. Bot. (Schrader)* 1800 (2): 61. 1802. TYPE: *Diplazium plantagineum* (L.) Sw. (*Hemionitis plantaginea* Sm., *Asplenium plantagineum* L., *nom. superfl.* for *A. plan-*



taginifolium L.) = *Diplazium plantaginifolium* (L.) Urban. **Figure 16.**

Anisogonium Presl, Tent. pterid. 115. 1836. TYPE: *Anisogonium fraxinifolium* (Presl) Presl = *Diplazium fraxinifolium* Presl.

Diplazium subgenus *Anisogonium* (Presl) C. Chr., Index fil. xxxi. 1906.

Plants terrestrial, rarely epipetric or epiphytic. **Stem** commonly erect, in some species to 1 m tall, often decumbent, rarely long-creeping, sparsely to abundantly scaly, with not or scarcely clathrate scales, and usually bearing many long fibrous roots. **Leaves** essentially monomorphic, ca. 25 cm to 3 m long, caespitose to (occasionally) subdistant, not articulate to the stem. **Lamina** simple and entire to 3-pinnate-pinnatifid, glabrous to sparsely pubescent or somewhat scaly on abaxial axes, on some species bearing a proliferous bud distally on the rachis, axes adaxially sulcate and usually amply and minutely puberulent within the sulci. **Rachis** deeply sulcate adaxially, the costae less so but the edges of the sulci often thin and raised, interrupted and enlarged at the junction with the axis of the next order, in a few species appearing as perpendicular, herbaceous wings. **Veins** free, or in a few species anastomosing and the areoles without included veinlets. **Sori** elongate, elliptic to (more commonly) linear, borne on one or often both sides of the vein (diplazioid), receptacle scarcely or slightly raised, lacking paraphyses. **Indusia** commonly very narrow, often delicate and hyaline, attached along the vein, sometimes shriveling at maturity, rarely fugacious or lacking. **Sporangia** on stalks with 2 or 3 files of cells, annular cells (12–)15–20. **Spores** more or less ellipsoidal, monolete, laesura with winglike folds, the surface smooth, or papillate to echinate.

Diplazium is a pantropical genus of over 300 species, and although a number of regional treatments have appeared in recent years, it is sorely in need of monographic work. Little has been done to delineate true relationships of species or infrageneric groups. The following key, as in previous floristic works, artificially separates many species according to degree of laminar dissection. Although this character frequently is helpful in key-

ing out certain taxa, there is evidence to suggest it is a poor indicator of species relationships. Characters that more accurately note true affinities seem to be those of venation, indument, and perhaps soriation.

There is ample evidence of hybridization within the genus in Peru, especially in the species with decompound leaves. A number of intermediate specimens have been examined, many with abortive sporangia.

A relatively small group of species with areolate venation and unusual stem scales perhaps merits recognition as subgenus *Anisogonium*. At least one species (*D. lechleri*) is distinguished by otherwise free veins connected by an inframarginal vein. Certain species complexes are characterized by coarse, rigid scales on stem and axes, others have thin, flaccid ones, and still others entirely lack laminar scales. Minute, 1–2-celled trichomes occur on rachis and costae in varying frequency and position, but this feature is more variable and hence probably less reliable as a group indicator than are scales.

Sori borne “back-to-back” on both acroscopic and basiscopic sides of a vein were termed diplazioid by early authors, and this has become the trademark of the genus. There are rare examples of this in *Asplenium*. These sori appear more commonly in some species than others, but the frequency of their occurrence seems not to delineate groups as well as the color, texture, and shape of indusia. More critical study of sori and indusia would be advisable in future studies of the genus.

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FIG. 16. *Diplazium cristatum*: a, habit, *D. roemerianum*: b, apex of lamina. *Diplazium striatum*: c, base of pinna segment; d, portion of rachis and pinnae bases, adaxial side. (a from Schunke V. 2733, F; b from Harling et al. 19758, Ecuador, F; c from J. Schunke 295, F; d from L. Williams 702, F.)

a. Veins copiously anastomosing b

b. Leaves pinnatifid to pinnatisect, often pinnate at base, conspicuously petiolate 29. **D. pinnatifidum**

b. Leaves simple, subentire, petiole short or lacking 30. **D. praestans**

a. Veins free or, in *D. lechleri*, connected only at their tips by a slightly inframarginal vein c

c. Leaves simple, subentire 28. **D. plantaginifolium**

c. Leaves pinnate to decompose d

d. Pinnae deeply pinnatifid to nearly 3-pinnate, or if subentire to shallowly lobed then conspicuously inequilateral at base (cuneate or excavate basiscopically, truncate and strongly produced and often auriculate acroscopically) e

e. Pinnae, at least several proximal pairs, 1–3-pinnate f

f. Costae essentially glabrous abaxially, or sometimes with spreading trichomes 0.4–0.5 mm long or filiform scales, but never regularly and minutely puberulent g

g. Pinnae and pinnules strongly reflexed; axes flexuous 13. **D. flexuosum**

g. Pinnae and pinnules spreading or ascending; axes essentially straight (costae occasionally somewhat sinuous near apex) h

h. Scales of axes, especially of costae and costules, frequent to abundant, conspicuously setose i

i. Scales of axes bicolorous, the marginal cells and teeth castaneous to blackish, the teeth mostly bifid; sori linear, mostly 3–4 mm long; pinnae remote **D. remotum**

i. Scales of axes concolorous, the marginal teeth not bifid; sori elliptic, less than 2 mm long; pinnae approximate 7. **D. moritzianum**

h. Scales of the axes, if any, with margins entire (rarely remotely denticulate) j

j. Indusia thick, bicolorous, dark brown, but blackish near line of attachment 8. **D. bicolor**

j. Indusia thin, essentially concolorous throughout k

k. Lamina 2-pinnate, pinnules of larger pinnae crenate to lobed, cut halfway or less to the costules, free portion of segment (if any) commonly as broad as long 3. **D. ambiguum**

k. Lamina 2–3-pinnate-pinnatisect, pinnules of larger pinnae cut $\frac{3}{4}$ or more to the costule (or tertiary segments free and again pinnatifid), free portion of segment 1.5–4 times as long as broad l

l. Costules conspicuously alate adaxially, the wings often interrupted at segment bases and expanded into cristate lamellae; indusia margins erose-ciliolate 5. **D. buchtienii**

l. Costules not or slightly alate, the wings (if any) not or scarcely expanded; indusia subentire (in *D. hians* irregularly splitting at maturity) m

m. Indusia tumid (inflated); veins commonly 4 or 5 pairs per ultimate segment; free portion of ultimate segments about 1.5 times as long as broad 1. **D. hians**

m. Indusia flat; veins 6–8 pairs in larger segments; free portion of ultimate segments 2–4 times as long as broad n

n. Free portion of ultimate segments twice as long as broad; costae and costules either moderately scaly or slightly pubescent with spreading trichomes about 0.4 mm. long 2. **D. divergens**

n. Free portion of ultimate segments 3–4 times as long as broad; costae and costules completely lacking indument 6. **D. vastum**

f. Costae moderately to abundantly puberulent on abaxial side with minute trichomes, these 0.1–0.2 (0.3) mm long and sometimes partly obscured by scurf o

o. Tissue between the veins on abaxial surface minutely puberulent 10. **D. expansum**

o. Tissue between the veins glabrous p

- p. Lamina (2-)3-pinnate-pinnatisect; sori less than 2 mm long; pinnules 1.5-4(-5) cm long 4. **D. alienum**
- p. Lamina 2-pinnate (pinnules entire to deeply lobed); sori 4-10 mm long; larger pinnules (4-)5-12 cm long q
- q. Pinnae with 12-16 pairs of pinnules; larger pinnules 4-6 times as long as broad, entire or crenate-serrate; indusia dark brown with a blackish base 11. **D. venulosum**
- q. Pinnae with less than 8 free pairs of pinnules; larger pinnules 3-3.5 times as long as broad, most of them deeply lobed to pinnatifid (sometimes subentire); indusia light brown 12. **D. tungurahuae**
- e. Pinnae subentire to pinnatisect (rarely fully pinnate at the base of basal pinnae) r
- r. Pinnae commonly truncate and subequilateral at base, or sometimes more strongly produced basiscopically s
- s. Proliferous buds commonly in the axils of distal pinnae; proximal pinnae deltoid or subdeltoid, larger ones 9-22 cm broad, their ultimate segments with attenuate or acuminate apices 14. **D. macrophyllum**
- s. Proliferous buds lacking; proximal pinnae ovate, elliptic or oblong (rarely deltoid-lanceolate), larger ones 3-5.5(-7) cm broad, their ultimate segments obtuse to acute t
- t. Ultimate segments of proximal pinnae narrowly acute, their margins crenate to shallowly lobed; mature leaves 75 cm long and 22 cm broad 15. **D. subobtusum**
- t. Ultimate segments obtuse, occasionally subacute, their margins subentire to serrulate; mature leaves 1-2 m long and 30-50 cm broad u
- u. Indusia vestigial or lacking; sori mostly 1.5-2.5 mm long; lamina chartaceous to subcoriaceous; ultimate segments of larger pinnae more than 20 pairs 16. **D. lindbergii**
- u. Indusia persistent; sori mostly 3-7 mm long; lamina firm-membranaceous; ultimate segments of pinnae 15 pairs or fewer 17. **D. striatum**
- r. Pinnae (most of them) conspicuously inequilateral at base, cuneate or excavate basiscopically, truncate and much more strongly produced (often auriculate) acroscopically .. v
- v. Pinna base attenuate or excavate basiscopically, opposed acroscopically by a greatly elongated auricle; basiscopic pinna margin subentire, crenate, or shallowly lobed (sometimes pinnatifid on the basal pinnae) 21. **D. bombonasae**
- v. Pinna base cuneate to shallowly or deeply lobed basiscopically, opposed acroscopically by a slightly enlarged basal lobe; basiscopic margins of (at least) proximal pinnae deeply lobed to pinnatisect w
- w. Rachis bearing a proliferous bud on the adaxial side towards the apex; free pinnae 16-20 pairs; proximal pinnae subequilateral at base 18. **D. caracasana**
- w. Rachis lacking proliferous buds; free pinnae 8-15 pairs; proximal pinnae (and others) conspicuously inequilateral x
- x. Proximal pinnae incised nearly to costa, their basal acroscopic segments free and usually short-stalked; indusium usually with a very narrow, whitish margin; scales of stem apex somewhat flaccid, dull medium-brown, 3-4 mm long .. 19. **D. stuebelianum**
- x. Proximal pinnae lobed $\frac{1}{4}$ to $\frac{3}{4}$ to the costa, their ultimate segments never free; indusium concolorous; scales of stem apex coarse, castaneous to blackish, often sublustrous, 1-3 mm long 20. **D. cristatum**
- d. Pinnae entire to crenate, or lobed $\frac{1}{4}$ or less to costa, essentially subequilateral at base y
- y. Lamina gradually reduced to a pinnatifid apex z
- z. Pinnatifid apical portion of leaf about $\frac{1}{2}$ the length of the lamina; free pinnae 2-4 pairs 25. **D. paucijugum**
- z. Pinnatifid apical portion of leaf $\frac{1}{5}$ (or commonly less than) the length of the lamina; free pinnae on mature leaves 7-25 pairs aa

- aa. Rachis and costae sparsely to moderately provided on abaxial side with appressed (often filiform) scales; a proliferous bud often borne distally on the rachis 24. **D. celtidifolium**
- aa. Rachis and costae lacking scales; proliferous bud lacking bb
- bb. Pinnae 11–17 pairs, most of them lobed about 1/4 to the costa, acute at apex, broadest near the center 22. **D. cuneifolium**
- bb. Pinnae commonly less than 10 pairs, with entire to shallowly crenate margins and acuminate apex, broadest at or near the base 23. **D. grandifolium**
- y. Lamina terminating abruptly in a conform or subconform apical segment (or rarely non-conform: with 1 or 2 basal lobes) cc
- cc. Veins 1–2 forked, not connected by an inframarginal vein; sori arching, the indusia thin, mostly borne on one side of a vein. 26. **D. roemerianum**
- cc. Veins simple, or paired at the costa, connected at their tips by a slightly inframarginal vein; sori straight, the indusia firm, rigid, mostly double 27. **D. lechleri**

1. **Diplazium hians** Klotzsch, Linnaea 20: 361. 1847. TYPE: Venezuela, Mérida, *Moritz 289*, in part (holotype, B, frag., US!; isotypes, BM!, K!, frags., US! of BM & K; photos, US of BM & K).

Plants terrestrial, rarely on bases of tree trunks. **Stem** erect, this and the very base of the petiole provided with blackish, lanceolate scales to 1.5 cm long. **Leaves** to 2 m long, 2-pinnate-pinnatifid. **Lamina** chartaceous or subcoriaceous, to 80 cm broad, glabrous abaxially, the costae and costules moderately to abundantly scaly. **Pinnae** contiguous, patent or ascending, short-stalked or sessile, costae on abaxial side with scales orange to castaneous, filiform to lanceolate or ovate and attenuate. **Pinnules** moderately to deeply lobed, costules adaxially with parallel, cartilaginous ribs, abaxially scaly as on the costae. **Ultimate segments** 8–10 pairs, obtuse, subentire, the free portion about 1.5 times as long as broad. **Veins** free, commonly 4 or 5 pairs on a segment. **Sori** elliptic, all except basal ones less than 2 mm long. **Indusia** thin, gray-brown, tumid (inflated) and subentire until maturity, then usually irregularly splitting, with only a narrow portion persistent.

In forests, 1200–3100 m, San Martín, Pasco, Junín.

Venezuela; Colombia; Ecuador; Peru; Brazil.

This species has been poorly understood—it is often a name under which several species have been placed. The type collection is a mixture; *Moritz 289* at Paris is a new species called *D. moritzianum* from Colonia Tovar, Edo. Aragua; the other isotypes are from Edo. Mérida. With *D. hians* probably should be included *D. bogotense* (Kar-

sten) Hieron. of Colombia, and perhaps also *D. altissimum* (Jenm.) C. Chr. from the Greater Antilles. The species included as *D. hians* in Proctor's "Ferns of Jamaica" (1985, p. 405) is something else, for the minor axes are described as puberulous, with scales few or lacking. Furthermore, Field Museum specimens from the Greater Antilles that are annotated as *D. hians* have linear, persistent indusia (not elliptic, tumid, and evanescent). Taxa allied with this species are in great need of revision. Also see *D. divergens* for further discussion.

San Martín: Prov. Mariscal Cáceres, Río Abiseo, *León & Young 2164* (F, UC, USM). **Pasco:** Prov. Oxapampa, Dist. Oxapampa, Río Alberto, *León 649* (USM). Prov. Oxapampa, 4–5 km N of Mallampampa, *D. Smith & Canne 5804* (MO, UC). Prov. Oxapampa, San Alberto, Cordillera de Yanachaga, *van der Werff et al. 8479* (MO, UC). **Junín:** Carpapata, above Huacapistana, *Killip & Smith 24462* (GH, US). Chanchamayo Valley, *C. Schunke 144, 147, 166* (F).

2. **Diplazium divergens** Rosenst., Repert. Spec. Nov. Regni Veg. 12: 471. 1913. TYPE: Bolivia, Yungas, Polo-Polo, near Coroico, *Buch-tien 3393* (holotype, B?; isotypes GH!, P!, US!; photos, F & US of P).

Plants terrestrial. **Stem** erect, this and the petiole base sparsely scaly. **Leaves** to 2 m long, 2-pinnate-pinnatifid. **Lamina** firm-membranaceous, to 80 cm broad, the costae and costules moderately scaly, the scales orange, filiform to linear and attenuate, glabrous, or rarely the costae with scattered spreading trichomes about 0.4 mm long. **Pinnae** contiguous to subdistant, proximal ones conspicuously petiolate. **Pinnules** deeply pinnatisect. **Ul-**

timate segments 12–15 pairs, obtuse, free portion twice as long as broad. **Veins** free, commonly 6–8 pairs on a segment. **Sori** linear, most of them 1.5–2.5 mm long. **Indusia** thin, gray-brown, flat, subentire.

In forests, 1000–2100 m, Huánuco, Pasco, Junín.

Peru and Bolivia.

This rare species is closely related to, and often confused with, *D. hians*, but the lamina is thinner in texture, ultimate segments are more numerous and relatively narrower, and the indusia are linear and flat, not elliptic and tumid. The Bryan and Smith specimens cited below are intermediate between the two in most characters. They have abortive sporangia and are apparently hybrids. The Macbride collection seems to be a hybrid involving *D. divergens* and a pubescent species, as it has few scales on the axes, but has some spreading trichomes on the costae abaxially, and also has many abortive sporangia.

Huánuco: Muña, *Bryan 550* (F, US), *Macbride 4036* (F, GH, US). **Junín:** Chanchamayo Valley, *C. Schunke 44, 708* (F). **Pasco:** Prov. Oxapampa, Río El Tunqui, *D. Smith et al. 1721* (F, MO).

3. ***Diplazium ambiguum*** Raddi, *Opusc. Sci.* 3: 292. 1819. TYPE: Brazil, Mandioca, *Raddi* (holotype, FI?; isotype, FI; photo, US of FI).

Athyrium ambiguum (Raddi) Milde, *Bot. Zeit.* (Berlin) 28: 350. 1870.

Diplazium ambiguum var. *pubescens* Rosenst., *Hedwigia* 46: 108. 1906. TYPE: Brazil, Estado Santa Catharina, Blumenau, Passo Mansa, *Haerchen 96* (holotype, s; possible isotype, US).

Plants terrestrial. **Stem** erect, this and the petiole base scaly, the scales firm, dark brown to blackish, lanceolate or linear-lanceolate, the margins subentire. **Leaves** to 1.4 m long, 2-pinnate. **Lamina** firm-herbaceous to chartaceous, to 70 cm broad, abaxially glabrous, or the costae and costules sparsely to moderately pubescent with spreading, articulate trichomes, these mostly 0.4–0.5 mm long. **Pinnae** approximate, or proximal ones subdistant, patent or slightly ascending, stalked, costae sparsely scaly (rarely naked), the scales light brown, ovate and attenuate to filiform, their margins entire. **Pinnules** sessile, often partially adnate, crenate or lobed about halfway to the costule, costules abaxially scaly as on the costae, adaxially with low, parallel,

herbaceous or cartilaginous wings, these sometimes interrupted and expanded near segment bases, but not produced into conspicuous lamellae. **Ultimate segments** (if any) with free portion commonly broader than long. **Veins** free, 3–6 pairs to a segment. **Sori** linear, commonly 3–5 mm long. **Indusia** linear, persistent, thin, light or dark brown, flat, the margins subentire or, very rarely, erose-ciliolate.

In forests, 150–2400 m, Amazonas and Loreto to Ayacucho.

Venezuela and Colombia, south to Brazil and Paraguay.

Diplazium ambiguum is a fitting name for the specimens assigned to this species. There is some question that it is correctly applied, since the type has not been examined. However, all specimens so determined from Peru match the simple original description and the excellent set of six isotype photos at us. It is distinguished from the other decompound species in that leaves are essentially 2-pinnate. The pinnules of larger pinnae are sessile, many of them at least partly adnate, and are crenate or dissected halfway or less to the costule. Other decompound species are at least deeply 2-pinnate-pinnatisect and either glabrous on the axes abaxially or regularly and minutely puberulent, with stout, rigid 1–3-celled trichomes mostly 0.1–0.2 mm long. Most specimens of *D. ambiguum* are glabrous abaxially, but occasionally the costae and costules are sparsely to moderately pubescent with spreading, delicate, multicellular trichomes about 0.5 mm long.

This species is most closely related to *D. diplazioides* (Klotzsch & Karsten) Alston, of northern South America, Central America, and the Lesser Antilles, but the latter differs in that the pinnules are cut nearly or quite to the costule, the sori are much shorter, the indusia are always erose-ciliolate, and the axes are never abaxially pubescent.

Diplazium ambiguum further lives up to its name in the characters of indusia and indument. Margins of the indusia are predominantly entire but occasionally are erose-ciliolate, as in *D. diplazioides*. Axes are most commonly glabrous abaxially, but sometimes they are pubescent with spreading, multicellular trichomes. (On *Spruce 4344* from Monte Campana, San Martín, axes of different leaves vary from glabrous to pubescent.)

Further uncertainty is introduced by Rosenstock's *D. ambiguum* var. *pubescens*, which was said to differ from the typical in the glandular-puberulent axes and fimbriate indusia. Although

the type has not been seen, a topotype, *Haerchen 35a* (F), does have erose-ciliolate indusia, but the axes are glabrous abaxially. Costae are puberulent adaxially, which perhaps is what Rosenstock was referring to, but this condition is quite common throughout the genus, so the character is of little importance.

Obviously this species and its allies are very much in need of further study, throughout their range.

Amazonas: Mouth of Río Santiago, *Tessmann 4390* (us). **San Martín:** Prov. Mariscal Cáceres, Dist. Tocache Nuevo, Quebrada Saule Chico, *J. Schunke V. 4362* (F, GH, US). Monte Campana, near Tarapoto, *Spruce "4344"* (BM, BR, K, W). Mt. Guayrapurima, *Spruce "4344"* (P). **Loreto:** Prov. Maynas, Yanamono Tourist Camp, *van der Werff et al. 9855, 9868* (MO). **Pasco:** Oxapampa, 4–5 km N of Mallampampa, *D. Smith & Canne 5801* (MO). **Junín:** Prov. Chanchamayo, Chilpes, *D. Smith & Palacios 2637* (F, MO). **Ayacucho:** "Aina" (Ayna), between Huanta and Río Apurímac, *Killip & Smith 22727* (us).

4. *Diplazium alienum* (Mett.) Hieron., Hedwigia 59: 336. 1918.

Asplenium alienum Mett., Fil. lechl. 2: 18. 1859. LECTOTYPE (designated here): Peru (Puno), San "Gaván" (Gabán), *Lechler 2320* (B!; ISOLECTOTYPE, P!; photos, BM & F of B, GH & US of P.). PARATYPE: *Lechler 2173* (B!).

Asplenium fuscopubescens Hooker, Sp. fil. 3: 264. 1860. LECTOTYPE (designated here): Peru, (San Martín), Monte Campana, near Tarapoto, *Spruce 4759* (K!; ISOLECTOTYPES, BM!, P!; photos, GH & US of BM). *Schlim 69* of Colombia, also cited by Hooker, is *Diplazium gracilescens*.

Diplazium fuscopubescens (Hooker) Moore, Index fil. 329. 1861.

Diplazium lehmannii Hieron., Bot. Jahrb. Syst. 34: 458. 1904. TYPE: Colombia, "prope Ricaurte ad rivulum Cuaiquer," *Lehmann 5064* (holotype, B; frag., BM!; isotypes, F!, us!).

Plants terrestrial, or occasionally growing on the base of tree trunks. **Stem** erect, this and the petiole base provided with a few broad, brown scales. **Leaves** to 2 m long, 2–3-pinnate–pinnatisect. **Lamina** firm–membranaceous, to 50 cm broad, the costae, and often the costules and rachis, moderately to abundantly puberulent abaxially, the trichomes spreading, septate, 0.1–0.3 mm long. **Pinnae** truncate and subequilateral at the base. **Pinnules** 10–20 pairs on larger pinnae, 1.5–4(–5) cm long, the costules adaxially alate, the wings perpendicular to the lamina and often expanded into crestlike lamellae. **Ultimate segments** 8–12 pairs, those of larger pinnae usually free, lobed to pinnatisect.

Veins free. **Sori** less than 2 mm long, usually single, occasionally diplazioid. **Indusia** light or (more commonly) dark brown, subentire to lightly erose or ciliolate, persistent.

In dense, wet forests and wooded valleys, 700–2700 m, San Martín to Cuzco and Puno.

Colombia; Ecuador; Peru; Bolivia.

Hooker and Baker (Syn. fil. 242. 1867) treated this as conspecific with *Asplenium sandwichianum* (= *Diplazium sandwichianum* (Presl) Diels) of Hawaii. The type of the latter has not been examined, but herbarium specimens so determined are less dissected and puberulent, and costules are scarcely winged. The disjunction is also unlikely.

Diplazium buchtienii is possibly synonymous; see treatment of the latter for further discussion. A distinctive feature of this species and *D. alienum* is the conspicuous wings on the adaxial side of the costules, which are membranaceous and borne perpendicular to the lamina surface. Often these are expanded, near the bases of tertiary segments, into crestlike lamellae similar to those in certain species groups of *Hymenophyllum*.

Huánuco: Slope of Río Llullapichis watershed, ascent of Cerros del Sira, *Dudley 13252* (GH), *13253* (MO, US). **Pasco:** Prov. Oxapampa, Palcazú Valley, Río San José, *D. Smith 3949* (MO, UC). **Junín:** Prov. Satipo, Pichanaki, *León 230* (USM). **Cuzco:** La Convención, Valle San Miguel, *Bües 2147* (GH, US). Prov. La Convención, Cordillera Vilcabamba, *Dudley 10326B* (GH). **Madre de Dios:** Prov. Manú, Cerro de Pantiacolla, *Foster et al. 10702* (F).

5. *Diplazium buchtienii* Rosenst., Repert. Spec. Nov. Regni Veg. 6: 312. 1909. TYPE: Bolivia, San Carlos, near Mapi, *Buchtien 1136* (holotype, B?; isotype, US!).

Plants terrestrial. **Stem** erect, this and the very base of the petiole provided with broad, firm, castaneous to blackish scales. **Leaves** 60–150 cm long, 2–3-pinnate–pinnatisect. **Lamina** firm–membranaceous to chartaceous, to 40 cm broad, essentially glabrous abaxially, scales lacking, or rare and scattered. **Pinnae** approximate, slightly ascending, sessile, or proximal ones short-stalked. **Pinnules** 10–16 pairs per pinna, perpendicular to the costa, the costules adaxially alate, the wings often interrupted at segment bases and there expanded into crestlike lamellae. **Tertiary segments** 8–15 pairs, entire and adnate to free and again pinnatifid. **Veins** free, 4(5) pairs on a segment, or less. **Sori** elliptic, less

than 2 mm long. **Indusia** light or dark brown, thin, erose-ciliolate.

In wet forests, 1200–2500 m, Huánuco to Cuzco.

Peru; Bolivia.

This species probably should be included with *D. alienum*, as it seems to differ from the latter primarily in its glabrous, rather than regularly puberulent, axes on the abaxial side. Although the occurrence of laminar trichomes and/or scales is presumed to be a strong diagnostic character in *Diplazium*, it seems to be less consistent in some species groups. Monographic study is needed.

Huánuco: Prov. Huánuco, km 452, Lima–Tingo María road, *Young & Sullivan 557* (MO, UC). **Pasco:** Prov. Oxapampa, San Alberto, Cordillera de Yanachanga, *van der Werff et al. 8456* (MO, UC). **Junín:** Chanchamayo Valley, *C. Schunke 49, 143, 171* (F). **Cuzco:** Prov. Paucartambo, Valle de Pillahuata, *Herrera 1612* (US).

6. *Diplazium vastum* (Mett.) Diels, Nat. Pflanzenfam. 1(4): 228. 1899.

Asplenium vastum Mett., Ann. Sci. Nat. Bot., ser. 5, 2: 237. 1864. TYPE: Colombia, Bogotá, Alto Trigo, *Lindig 349* (holotype, B, frag., US!; isotypes, BM, K!, P!; photos, F, GH, US of P).

Diplazium tarapotense Rosenst., Repert. Spec. Nov. Regni Veg. 7: 295. 1909. TYPE: Peru, San Martín, Tarapoto, Mt. Campana, *Spruce 4682* (holotype, P!; isotypes, BM!, GH!, K!; frag., US! of BM; photos, GH & US of P).

Plants terrestrial. **Stem** not seen, probably erect. **Leaves** huge, probably to 2 m long, 2-pinnate-pinnatifid, occasionally 3-pinnate as to base of larger pinnae. **Lamina** firm-membranaceous to chartaceous, to 80 cm broad, pale green and glabrous abaxially, lacking scales, dark green adaxially. **Pinnae** subdistant, somewhat ascending, long-stalked. **Pinnules** incised nearly or quite to the costule, numerous, subdistant, proximal ones short-stalked, costules adaxially with low, thickened wings, these often interrupted and slightly expanded near segment bases, but not produced into lamellae. **Ultimate segments** 10–15 pairs, narrow-oblong, with parallel sides, commonly obtuse, ascending, entire or occasionally crenulate, larger ones 3–4 times as long as broad. **Veins** free, 6–8 pairs on larger segments. **Sori** linear, 2–3 mm long. **Indusia** thin, light brown, subentire, persistent.

In dense forests, 500–1800 m, San Martín, Junín, Cuzco.

Colombia; Ecuador; Peru.

Among the decompound species of the genus, this species is marked by its naked lamina, which is dark green adaxially and quite pale green abaxially, the stramineous axes, the stalked, subdistant pinnae and pinnules, and the ascending, commonly obtuse, ultimate segments with parallel sides.

Peyton & King 1422 from Prov. La Convención in Cuzco (GH, MO) is a hybrid involving *D. vastum*. The lamina has the typical light green color abaxially, and the pinnules have numerous, narrow, ascending segments, but the axes are amply provided with attenuate, spreading scales, and the indusia are short and elliptic. The sporangia are all abortive.

Junín: Prov. Tarma, Chanchamayo, *Esposito* (Cat. No. 11011, USM), *C. Schunke 79, 447, 843* (F, US). **Cuzco:** Prov. Paucartambo, Hacienda Villa Carmen, *Vargas 14681* (GH).

7. *Diplazium moritzianum* Stolze, *sp. nov.*

Squamae caulis nigellae, ovato-lanceolatae, marginibus integris vel denticulatis; folium usque ad 2 m longum, 2-pinnato-pinnatisectum; lamina in pagina abaxiali glabra, axibus moderate vel abundanter paleaceis; pinnae contiguae, sessiles vel petiolulatae; costae et costulae squamis fuscis vel castaneis, dentatis vel setosis; segmenta ultima 6–10-jugata, obtusa, saepe crenato-serrata; venae liberae, 3–5-jugatae; sori elliptici, minus quam 2 mm longi; indusium tenue, plerumque planum, erosociliatum.

Plants terrestrial. **Stem** erect to ascending, this and the petiole base scaly, the scales coarse, blackish, sublustrous, ovate-lanceolate, the margins entire to remotely denticulate. **Leaves** to 2 m long, 2-pinnate-pinnatisect. **Lamina** chartaceous, to 70 cm broad, abaxially glabrous, the axes moderately to abundantly scaly. **Pinnae** approximate, patent or ascending, sessile, or proximal one stalked, costae with scales dark brown or castaneous, narrow, attenuate, the margins conspicuously dentate to setose. **Pinnules** deeply incised, often nearly to the costule, costules abaxially scaly as on the costae, adaxially with low herbaceous parallel wings, these often interrupted and expanded near segment bases, but not produced into conspicuous lamellae. **Ultimate segments** 6–10 pairs, obtuse, larger ones crenate-serrate and about twice as long as broad.

Veins free, 3–5 pairs to a segment. **Sori** broadly elliptic, less than 2 mm long. **Indusia** persistent, thin, light or dark brown, flat or occasionally slightly tumid, the margins erose-ciliate.

TYPE—Venezuela, Colonia Tovar, *Moritz 289*, in part (holotype, P!, 2 sheets; frag., F!; photos, F & GH of P).

Montane rain forests, 2600–3100 m, San Martín, Huánuco, Pasco.

Venezuela; Peru; southeastern Brazil (*Lanna 1708* [F]).

This has the same type number as *D. hians*, but type specimens of the latter are designated as Mérida, “Colombia” [Venezuela], whereas the two sheets at Paris are designated as Colonia Tovar, which is in Edo. Aragua. The Paris specimens represent a very different species, with scales on axes conspicuously dentate to setose, the ultimate segments relatively narrower and usually crenate-serrate, and the indusia commonly flat, with margins erose-ciliate. In comparison, *D. hians* has scales with entire margins, ultimate segments broader and subentire, and indusia strongly tumid.

Diplazium moritzianum is more closely related to *D. pedatum* Klotzsch of Venezuela, which also has indusia with fimbriate margins. Among other characters, the latter differs from *D. moritzianum* in the very narrow, often subulate and entire rhizome and petiole scales.

San Martín: Prov. Mariscal Cáceres, near Mirador, Río Abiseo National Park, *León 2164* (F, USM). **Huánuco:** Carpish Divide, *Sandeman 5117* (K). **Pasco:** Prov. Oxapampa, Río San Alberto Valley, *D. Smith & Pretel 8033* (GH, MO).

8. *Diplazium bicolor* Stolze, *sp. nov.*

Folium 2-pinnato-pinnatifidum, usque ad 1.5 m longum; lamina glabra, squamis absentibus; pinnae subdistantes, petiolulatae; pinnulae numerosae, subdistantes, ad basin truncatae, ad apicem attenuatae; segmenta ultima lata, obtusa; venae liberae, 4–5-jugatae; sori lineares; indusia crassa, integra, bicoloria, fusca et nigella.

Plants terrestrial. **Stem** erect to decumbent, provided with stout, appressed, ovate-lanceolate scales, these blackish brown, to 1.5 cm long, with margins entire. **Leaves** to 1.5 m long, 2-pinnate-pinnatifid, petiole essentially glabrous and not scaly. **Lamina** chartaceous, to 70 cm broad, glabrous except for sparse, minute puberulence in the sulci of axes adaxially. **Pinnae** subdistant, some-

what ascending, stalked. **Pinnules** pinnatifid, numerous, subdistant, gradually tapering from a truncate base to a pinnatifid, attenuate apex, costules adaxially with low, herbaceous wings perpendicular to the plane of the lamina. **Ultimate segments** about 10 pairs, obtuse, the free portion often nearly as broad as long. **Veins** free, 4–5 pairs on a segment. **Sori** linear, commonly extending from the midrib nearly to the segment margin, at least the basal acroscopic ones diplazioid. **Indusia** thick, the margins entire, bicolorous, essentially dark brown, but blackish near the line of attachment, commonly persistent.

TYPE—Peru, Pasco, Prov. Oxapampa, Dist. Oxapampa, Río San Alberto, *León 643* (holotype, F!; isotypes, GH!, USM).

Wet forests, 1200–2000 m, Pasco, Junín.

Peru; Bolivia (*Beck 3059* [F]).

This is one of a few species in Peru, including *D. celtidifolium*, with thick, bicolorous indusia. Indusia in the genus are typically thin-textured and delicate, and may be light to dark brown, whereas in *D. bicolor* they are thicker, quite firm, and dark brown, becoming blackish in a line along the point of attachment to the vein. Also characteristic is the “herringbone” soral pattern. The four or five pairs of sori are straight, ascending and crowded, and nearly fill the space between midrib and segment margin.

Junín: Chanchamayo Valley, *C. Schunke 662 “X”* (F).

9. *Diplazium remotum* Fée, *Crypt. vasc. Brésil*, 1: 81, t. 24, f. 1. 1869. **TYPE:** Brazil, *Glaziou 2332* (holotype, P).

Plants terrestrial. **Stem** erect, to 50 cm long, stout, subarborescent, provided with coarse, dark brown to blackish scales to 1 cm long. **Leaves** to 2 m long, 2-pinnate-pinnatifid. **Lamina** chartaceous, to 70 cm broad, glabrous, or axes minutely and sparsely puberulent abaxially, axes also moderately to abundantly scaly, the scales mostly bicolorous, the main body light brown, the margins castaneous to blackish and conspicuously dentate, the dark, elongated, teeth commonly bifid. **Pinnae** remote, stalked, patent to slightly ascending. **Pinnules** 8–12 free pairs (on larger pinnae), deeply incised. **Ultimate segments** 8–12 pairs, mostly obtuse and entire, or the apices crenulate-serrate. **Veins** free. **Sori** mostly 3–4 mm long and single, or those on basal veins diplazioid. **Indusia** linear,

bicolorous, brown or gray-brown, but blackish near point of attachment, firm, persistent, margins subentire or slightly erose.

In dense, wet forests, often on stream banks, 1700–3000 m, Amazonas to Cuzco.

Venezuela; Peru; Brazil.

The scales of the axes are most distinctive. They are the same as those of the putative areolate subgenus *Anisogonium*, i.e., with dark brown to blackish margins contrasting with the lighter brown of the main body of the scale, and elongated, setalike, bifid, marginal teeth. The type has not been examined, and the protologue mentions nothing of these singular scales. However, Fée's illustration does indicate the abundantly paleaceous axes, and an enlarged drawing of a scale depicts the long, marginal, apparently dark, teeth. Furthermore, Dr. Badré of the Laboratoire de Phanérogamie at Paris has kindly examined the holotype and confirmed the presence of these scales.

Probably conspecific is *D. rostratum* Fée, of Brazil, described in the same publication and illustrated as Figure 2 of the same plate. The former is described as having pinnule apices entire, the segment apices rostrate, and the rachis bicanaliculate, whereas in *D. remotum* the pinnule apices are supposed to be serrate, the segment apices dentate, and the rachis simply canaliculate. Dr. Badré has stated (*in litt.*) that the scales of the holotype (*Glaziou 2331*) are identical to those of *D. remotum*.

Skog & Skog 5210 (US), from Cuzco, apparently is a hybrid involving *D. remotum* and another species. The specimen has proliferous buds scattered all over the lamina, dentate scales (with teeth that are not always dark or bifid), and axes often puberulent abaxially. Most sporangia are abortive.

Amazonas: Prov. Bagua, 20 km E of La Peca, *Barbour 2763* (F, MO, UC). San Martín: Prov. Mariscal Cáceres, Río Abiseo National Park, *León 2160* (F). Pasco: Prov. Oxapampa, San Alberto, Cordillera de Yanachaga, *van der Werff et al. 8457* (MO). Cuzco: Prov. La Convención, Cordillera Vilcabamba, *Dudley 10460* (GH, MO). Prov. Paucartambo, Valle de Pillahuata, *Herrera 1623* (US in part).

10. *Diplazium expansum* Willd., Sp. pl. ed. 4, 5: 354. 1810. TYPE: Venezuela, Caracas, *Bredemeyer* (holotype, B!, *Herb. Willd.* 19948; photos, F, GH, US).

Asplenium expansum (Willd.) Presl, Reliq. haenk. 1: 46. 1825.

Allantodia asplenioides Kunze, Linnaea 9: 72. 1834. TYPE: Peru, Huánuco, Cuchero, *Poeppig*, Aug. 1829 (holotype, w; isotypes, B!, BM; prob. isotype, MO!; photos, BM, of w; GH, P & US of BM).

Diplazium asplenioides (Kunze) Presl, Tent. pterid. 114. 1836.

Athyrium expansum (Willd.) Milde, Bot. Zeit. 28: 353. 1870, not Moore, 1860.

Diplazium bonapartii Rosenst., Repert. Spec. Nov. Regni Veg. 7: 295. 1909. TYPE: Peru (San Martín), Monte "Guayrapurina" (Guayrapurima), *Spruce 4683* (holotype, P!; frag., US!; photos, F, GH, US).

Plants terrestrial. **Stem** erect, this and the petiole naked, or with a few dark brown scales. **Leaves** to 2 m long, 2-pinnate-pinnatifid. **Lamina** firm-membranaceous, to 70 cm broad, gradually reduced to a pinnatifid apex, minutely puberulent on costae, costules, veins, and leaf tissue abaxially, trichomes of the axes reddish brown, septate, 0.1–0.3 mm long, those between the veins mostly unicellular and whitish. **Pinnae** truncate and subequilateral at base, mostly stalked. **Pinnules** 10 pairs or more on larger pinnae, deeply incised (some basal ones nearly to the costule), truncate and subequilateral at base. **Ultimate segments** 8–12 pairs, mostly obtuse or truncate. **Veins** free. **Sori** mostly 2 mm long or less and single, or those of basal veins diplazioid. **Indusia** linear, thin, dark brown, erose-ciliolate, subpersistent.

In dense, wet forests, 100–2000 m, Loreto and San Martín to Cuzco.

Greater Antilles; southern Mexico; Guatemala; Venezuela; Colombia to Peru; Brazil.

This is distinguished from most species in the genus by the abundant minute trichomes on the tissue between the veins abaxially. *Diplazium bonapartii* has numerous, rather than sparse, appressed scales on the costules, but is otherwise identical, therefore conspecific. *Diplazium melanosorum* (Sodiño) C. Chr., of Ecuador and Colombia, is similar, but the lamina is subcoriaceous, and indusia are broadly elliptic instead of linear.

San Martín: Near Tarapoto, *Spruce 4124* (BM, K). Loreto: Prov. Maynas, 50 mi from Iquitos, *Moran 3655* (MO). Huánuco: Prov. Huánuco, Río Huallaga, above Río Cayumba, *Mexia 8316* (K, US). Junín: Prov. Tarma, Chanchamayo, *Esposito* (USM), *C. Schunke 35*, 43, 499 (F). Ucayali: Prov. Coronel Portillo, Boquerón, *Ferreya 16057* (GH, USM in part). Cuzco: Prov. Quispicanchi, Valle de Marcapata, *Herrera 1595* (US).

11. *Diplazium venulosum* (Baker) Diels, Nat. Pflanzenfam. 1(4): 226, 228. 1899.

Asplenium venulosum Baker, Syn. fil. 238. 1867. TYPE: Ecuador, Mt. Tungurahua, *Spruce 5343* (holotype, K!; isotypes, BM!, P!, W!; photos, F & GH of K).

Plants terrestrial. **Stem** erect, provided with copious, linear, brown scales, these to 1.5 cm long, their margins remotely ciliate or denticulate. **Leaves** to 3 m long, 2-pinnate, the petiole densely scaly as on the stem, but marginal teeth of scales elongated, more numerous and crowded. **Lamina** chartaceous, to 85 cm broad, often with a proliferous bud distally on the rachis, indument of the axes abaxially a mixture of minute trichomes, scurf (appressed squamules), and filiform brown, dentate scales. **Pinnae** narrowly acute at apex, subequilateral and truncate at base, mostly stalked, patent or slightly ascending. **Pinnules** remote, entire to crenate-serrate, free ones of larger pinnae 12–16 pairs, larger ones 6–12 cm long, 4–6 times as long as broad, costules adaxially provided with low wings of tissue perpendicular to the plane of the lamina, but these not abruptly expanded or cristate. **Veins** free. **Sori** linear, 5–10 mm long. **Indusia** dark brown, becoming blackish at base, firm, persistent, the margins subentire.

Rare, in dense, wet forests, usually along stream banks, 1700–1900 m, Amazonas and San Martín. Colombia; Ecuador; Peru.

In addition to the key characters, this species also can be separated from *D. tungurahuae* by the dense covering of linear, attenuate, tortuous, scales on the petiole. Few species of *Diplazium* have such an abundance of petiole scales. The few (if any) scales on the petiole base of *D. tungurahuae* are broad, rigid and appressed, with margins subentire.

Amazonas: Prov. Bagua, Cordillera Colán SE of La Peca, *Barbour 4189* (USM). **San Martín:** Prov. Rioja, Venceremos, *D. Smith 4456* (F, MO, UC).

12. *Diplazium tungurahuae* (Sodirol) C. Chr., Ind. fil. suppl. 1: 28. 1913.

Asplenium tungurahuae Sodirol, Anal. Univ. Central Quito 22: 97 (Sert. fl. Ecuad. 2: 20) 1908. TYPE: Ecuador, Tungurahua, *Sodirol*, in 1904 (holotype, Q?; isotype, P!; frag., US!; photos, GH & US of P).

Asplenium crassifolium Sodirol, Anal. Univ. Central Quito 22: 97 (Sert. fl. Ecuad. 2: 21) 1908. TYPE: Ecuador, Chillanes, Mt. Chimborazo, *Sodirol*, in 1891 (holotype, Q?; isotype, P!; photos, F, GH & US of P).

Diplazium crassifolium (Sodirol) C. Chr., Ind. fil. suppl. 1: 26. 1913.

Plants terrestrial. **Stem** erect or decumbent, provided at apex with coarse, dark brown scales about 1 cm long. **Leaves** to 1.5 m long, 2-pinnate. **Lamina** chartaceous, to 50 cm broad, often with proliferous buds on rachis or costae, indument of the axes abaxially a mixture of minute, 1- or 2-celled trichomes, broad, appressed scales, and scurf (appressed squamules). **Pinnae** subequilateral and truncate at base, mostly stalked. **Pinnules** subentire to pinnatifid, sessile to short-stalked, broadest at the base, free ones 8 pairs or fewer, larger ones 4–9 cm long, 3–3.5 times as long as broad, costules adaxially provided with low wings of tissue perpendicular to the plane of the lamina, but these not abruptly expanded or cristate. **Veins** free. **Sori** linear, commonly 4–6 mm long. **Indusia** light brown, persistent, with margins subentire or lightly erose.

In dense, wet forests, often in ravines or along stream banks, 100–2300 m, Cajamarca, Amazonas, and Loreto to Junín.

Colombia; Ecuador; Peru.

This species is a coarse fern, the broad pinnae and pinnules mostly triangular from a truncate base. As in most of the puberulent group of decompound species, the trichomes on the costae and costules abaxially are minute (in *D. tungurahuae* mostly 0.1 mm long and 1–2-celled). The minor axes also have few to many broad, appressed scales, and the costa and rachis also often have a sparse to ample covering of appressed squamules, that sometimes partially obscure the trichomes. Not all specimens examined have proliferous buds, but on those that do the buds often are on the costae as well as the rachis. This may be only a variant of *D. striatum*, under which see further discussion.

Cajamarca: Prov. Cutervo, road to San Andres National Park, *López & Sagástegui 5430* (GH, HUT, UC). **Amazonas:** Prov. Bongará, Shillac, *D. Smith & Vasquez 4886* (MO, UC). **Loreto:** Balsapuerto, lower Río Huallaga basin, *Killip & Smith 28506* (US). **Huánuco:** Fundo Chela, Sinchono, *Aguilar 921* (USM). Tingo María, *Tryon & Tryon 5283* (BM, F, GH, US). **Pasco:** Prov. Oxapampa, Cordillera de San Matías, *D. Smith 2004* (F, MO). **Junín:** Chanchamayo Valley, *C. Schunke 960* (F, US).

13. *Diplazium flexuosum* Presl, Tent. pterid. 114. 1836, *nom. nov.* for *Asplenium flexuosum* Presl and with the same type.

Asplenium flexuosum Presl, Reliq. haenk. 1: 46, t. 7, f. 1. 1825, not Schrader, 1818. TYPE: Peru, "in vallibus Cordillerarum," Haenke (holotype, PR or PRC; isotype, K).

Athyrium flexuosum (Presl) Milde, Bot. Zeit. (Berlin) 28: 353. 1870.

Diplazium preslianum C. Chr., Index fil. 237. 1905, nom. superfl. for *Diplazium flexuosum* Presl and with the same type.

Plants terrestrial, probably clambering. **Stem** decumbent, provided at the apex with coarse, blackish scales to 6 mm long. **Leaves** to 2 m long, 2-pinnate-pinnatisect. **Lamina** chartaceous, essentially glabrous, with some scattered trichomes on the rachis, but not regularly puberulent, the axes conspicuously flexuous. **Pinnae** strongly reflexed, proximal ones long-stalked, to 60 cm long. **Pinnules** strongly reflexed, lobed to pinnatisect, inequilateral at base, broadly cuneate acroscopically, truncate and more strongly produced basiscopically. **Veins** free. **Sori** linear, 2–4 mm long, those of basal veins mostly diplazioid, the rest usually single. **Indusia** light brown or gray-brown, persistent, the margins entire to lightly erose.

In forests, leaves probably clambering on shrubs, about 1600 m, Huánuco and Ucayali.

Rare and endemic.

This cannot be confused with any other species of the genus in Peru. The alternate pinnae and pinnules are strongly reflexed and abruptly bent at the axils, which results in a conspicuous, flexuous aspect to the axes.

Huánuco: Pampayacu, Kanehira 181 (GH, US). **Ucayali** (as Loreto): Prov. Coronel Portillo, NE of the pass at La Divisoria, Skog et al. 5151 (F, US). **Department unknown:** Matthews 1818 (BM, K, US), Poeppig, in 1829 (K, P).

14. *Diplazium macrophyllum* Desv., Prodr. 280. 1827. TYPE: "Hab. in America calidiori," collector and locality not cited, but possibly *Dombey* or *Poeppig*, Peru (holotype, P; photos, GH, US).

Asplenium desvauxii Mett., Abh. Senckenberg. Naturf. Ges. 3: 225, f. 4, 1859, nom. nov. for *Diplazium macrophyllum* Desv., not *Asplenium macrophyllum* Mett. 1856.

Asplenium procerum Sodiro, Anal. Univ. Central Quito 22: 96 (Sert. Fl. Ecuad. 2: 19). 1908. TYPE: Ecuador "in silvis subtropic. val. Nanegal," Sodiro, 1891 (holotype, Q?; isotype, P!, 3 sheets; photos, F, GH).

Plants terrestrial. **Stem** erect, provided at apex with sublustrous, brown scales, these 8–14 mm long. **Leaves** to 2.5 m long, 1-pinnate-pinnatisect (at least proximally), petiole sparsely scaly toward base. **Lamina** to nearly 1 m broad, terminating abruptly in a pinnatifid apex, essentially glabrous (rachis rarely sparsely puberulent), but sparsely provided abaxially on costae and rachis with dull, light brown scales, these filiform or attenuate, mostly flaccid and appressed, and distal pinna axils commonly provided abaxially with proliferous buds. **Pinnae** subequilateral, proximal ones deltoid or subdeltoid, stalked, incised nearly (rarely quite) to the costa, distal ones subentire, larger pinnae 9–22 cm broad, their ultimate segments with attenuate or acuminate apices. **Veins** free, pinnately branched in the segments. **Sori** single, or often diplazioid on the basal acroscopic vein branch. **Indusia** commonly persistent, light to dark brown, or often blackish near their attachment to the vein.

In dense, wet forests, often in ravines and along stream and river banks, 400–1800 m, Amazonas to Cuzco.

Venezuela; Colombia to Bolivia.

Specimens of *D. macrophyllum* are often determined as *D. costale* (Sw.) Presl of Jamaica, which differs in the darker, larger, very abundant scales on the costae, the deeply serrate segment apices, and the short (ca. 5 mm) sori, which extend only halfway or less to the segment margin. There are several other taxa in this species complex, which is in need of more detailed examination: *Diplazium appolinaris* Fée (Lesser Antilles) belongs here, as well as *D. oxylobum* Sodiro (Ecuador). The latter, with short sori, appears to be intermediate between *D. macrophyllum* and *D. costale*.

A collection from San Martín, Knapp & Alcorn 7749 (F, MO), is similar to *D. macrophyllum* in every way except for its exceedingly dense indument. Leaves of the latter are essentially glabrous, and with a few scales, but in this specimen the petiole and rachis are covered with attenuate, brown scales with setulose margins, these to 2 cm long toward the stem, becoming shorter and less abundant in the distal portion of the lamina. In addition, the rachis distally and the costae and veins on both sides are beset with copious septate trichomes up to 1 mm long. A number of shorter trichomes also are borne adaxially on the tissue between the veins. Although the specimen is robust (leaf 1.5 m long), it is sterile, and may be merely a monstrous form or hybrid. At any rate,

it is inappropriate here to describe a new form or variety on the basis of a single, sterile specimen.

Amazonas: Prov. Bagua, valley of Río Marañón above Cascadas de Mayasi, *Wurdack 1860* (us). **San Martín:** Mt. Campana, near Tarapoto, *Spruce 4336* (BM, K, P). **Huánuco:** Prov. Huánuco, Dist. Churubamba, Mt. Santo Toribio, *Mexia 8249* (BM, F, GH, MO, UC, US). **Pasco:** Prov. Oxapampa, Palcazú Valley, Iscozacín, *Foster et al. 7881* (F, MO). **Junín:** Schunke Hacienda, above San Ramón, *C. Schunke A-194* (GH, US). **Ucayali** (as Loreto): Along Río Aguaytía above mouth of Quebrada Yurac-Yacu, *Croat 20888* (F, MO, UC). **Cuzco:** Prov. La Convención, Cordillera Vilcabamba, Río Klaus, *Dudley 10182* (GH, US). **Puno:** Near "San Gavan" (San Gabán), *Lechler 2158* (K, P).

15. **Diplazium subobtusum** Rosenst., Repert. Spec. Nov. Regni Veg. 7: 296. 1909. TYPE: Peru, San Martín, Mt. Guayrapurima (as Ecuador, "Monte Guayrapurina"), *Spruce 4019* (holotype, P!; frag., US!; photos, F, GH, US).

Plants apparently terrestrial. **Stem** erect, provided at apex with a few broad, castaneous scales. **Leaves** 75 cm long, 1-pinnate-pinnatisect above the 2-pinnate basal pinnae, petiole moderately pubescent, lacking scales. **Lamina** 22 cm broad, gradually reduced to a pinnatifid apex, axes and veins moderately puberulent abaxially with spreading, flexuous trichomes to 0.3 mm long, the intervening tissue also with scattered, shorter trichomes, costae abaxially with a few scattered, appressed, light brown scales, rachis lacking proliferous buds. **Pinnae** subequilateral, short-stalked, incised nearly (the basal pair quite) to the costa, the ultimate segments of proximal pinnae narrowly acute, their margins crenate to shallowly lobed. **Veins** free. **Sori** single, or frequently diplazioid. **Indusia** persistent, thin, light brown, the margins entire to slightly erose.

Known thus far in Peru only from the type collection, San Martín.

Costa Rica; Panama; Peru.

This is one of the questionable species related to *D. striatum*, from which it differs principally in the great degree of pinna dissection, a feature that is variable in the latter species. Apparently *D. subobtusum* has not been collected again in Peru since the type, nearly 130 years ago. It may be merely a variant of *D. striatum*. However, no matter how deeply lobed the pinnae of the latter, the ultimate segments are essentially entire, with obtuse to sub-

truncate apices (rarely subacute). Most of the segments in proximal pinnae of *D. subobtusum* are not only narrowly acute, but their margins are conspicuously lobed. In this respect, they are somewhat intermediate between *D. striatum* and *D. macrophyllum*. Furthermore, the leaf is only 75 cm long and 22 cm broad, whereas most leaves of *D. striatum* are 1–2 m long. Tentatively, then, *D. subobtusum* is maintained here as distinct.

16. **Diplazium lindbergii** (Mett.) Christ, Prim. Fl. Costar. 3: 27. 1901.

Asplenium lindbergii Mett., Ann. Sci. Nat. Bot. ser. 5, 2: 236. 1864. LECTOTYPE (designated by Lelinger, Proc. Biol. Soc. Wash. 89: 707. 1977): Brazil, Caldes, *Lindberg 543* (B).

Plants terrestrial. **Stem** erect or decumbent, sparsely scaly. **Leaves** to 1.5 m long, 1-pinnate-pinnatisect, petiole dark reddish brown to atropurpureous, toward the base provided with dull brown, linear or lanceolate scales about 1.5 cm long. **Lamina** chartaceous to subcoriaceous, to 40 cm broad, generally reduced to a pinnatifid apex, some sparse, filiform scales on the apex, glabrous except for some scattered, septate trichomes abaxially on the costa and segment midribs, lacking proliferous buds. **Pinnae** subequilateral, linear or linear-lanceolate, subsessile or short-stalked, incised $\frac{3}{4}$ to $\frac{7}{8}$ (or rarely quite) to the costa, costae awned adaxially near the base of costules, ultimate segments more than 20 pairs on larger pinnae, obtuse to truncate, often strongly revolute. **Veins** free. **Sori** 1.5–2.5 mm long (slightly longer on basal veins), often diplazioid. **Indusia** vestigial or lacking.

Rare in Peru, in wet forests, 1800–2000 m, San Martín, Pasco, and Cuzco.

Southern Mexico to Panama; Venezuela and Colombia, south to Bolivia and Brazil.

In this species, the raised, adaxial edges of costae are strongly produced, appearing usually as perpendicular, herbaceous wings. Where these are interrupted near the costule bases, the ends commonly separate from the costa, as short, subacute awns. A similar condition is evident in *D. striatum*, but the wings are less pronounced and the awns are less conspicuous or lacking in that species.

Several other neotropical species probably should be included here, among them *D. grande*

(Baker) C. Chr. (Colombia, Ecuador), *D. induratum* Diels (Costa Rica), and *D. subnudum* (Karsten) Alston (Colombia). Each has been separated from *D. lindbergii* chiefly on the degree of pinna dissection. In *Diplazium*, this highly variable feature is of little value when unsupported by other characters.

Specimens of *D. lindbergii* are often determined as *D. brasiliense* Rosenst., which is similar in aspect and texture. However, the type of the latter (Brazil, *Haerchen* 91, s!) has broader and fewer segments (to 12 pairs), the indusia are subpersistent, and the axes are minutely, but densely, puberulent abaxially.

San Martín: Prov. Rioja, Venceremos, *D. Smith & Vasquez* 4995 (F, MO, UC). **Pasco:** Prov. Oxapampa, SE of Oxapampa, *D. Smith* 2909 (F, MO). **Cuzco:** Prov. Paucartambo, Valle de Pilcopata, *Herrera* 1623 (us).

17. *Diplazium striatum* (L.) Presl, Tent. pterid.
114. 1836. Figure 16c–d.

Asplenium striatum L., Sp. pl. 2: 1082. 1753. TYPE: Petiver, Pter. Amer. t. 3, f. 3, 4, copied from Plumier, Traité foug. Amér. t. 18, 19, based on a specimen from Martinique.

Diplazium obtusum Desv., Prodr. 281. 1827. TYPE: "Crescit in Peruvia" ("Habitat in America calidiori" on label), collector unknown (holotype, p!; photos, BM, GH, US).

Diplazium tabalosense Hieron., Hedwigia 47: 214. 1908. TYPE: Peru (San Martín), above Tabalosos on the way to Moyobamba, Huallaga River valley, *Stübel* 1089 (holotype, b!; photos, BM, F, GH, US).

Plants terrestrial. **Stem** erect, near the apex sparsely provided with dark brown scales to 1 cm long. **Leaves** to 2 m long, 1-pinnate-pinnatifid to nearly 2-pinnate, petiole brown at base, lighter brown to stramineous distally, scaly at base. **Lamina** firm-membranaceous, to 50 cm broad, lacking proliferous buds, reduced to a pinnatifid apex, abaxially glabrous to minute puberulent, and axes sparsely to moderately provided with appressed, attenuate scales. **Pinnæ** (2.5–)3.5–5(–6) cm broad, lanceolate or deltoid-lanceolate, sessile to short-stalked, incised $\frac{1}{2}$ to $\frac{3}{4}$ (or sometimes quite) to the costa, costae with perpendicular herbaceous wings adaxially, these interrupted at base of costules, there sometimes ending as short awns. **Ultimate segments** 10–15 pairs or fewer, their apices obtuse to subtruncate (rarely subacute), their margins plane. **Sori** mostly 3–7 mm long, often diplaziod.

Indusia thin, light brown, often shriveling (but persistent) at maturity.

In dense forests, often in wet ravines or on river banks, 100–1800 m, Cajamarca, Amazonas, and Loreto south to Cuzco and Madre de Dios.

West Indies; southern Mexico to Panama; Venezuela and Colombia to Bolivia.

This species varies considerably in leaf dissection. Further study may prove that a number of related taxa are conspecific. Larger pinnæ of *D. striatum* vary from 2 cm broad and cut halfway to the costa, to 6 cm broad and dissected nearly or quite to the costa. Narrower pinnæ are more common toward the north of the range, whereas specimens from Peru typically have broader and deeply dissected pinnæ, as in the type of *D. tabalosense*. The leaves of *D. tungurahuae* are even more highly dissected. It is similar in most other characters and may better be considered a variety of *D. striatum*. In fact, some sheets of *Schunke* 295 (below) are intermediate between the two. A species with narrower, less dissected pinnæ is *D. angelipolitanum* Rosenst. (Colombia), which probably should be included with *D. striatum*.

Cajamarca: Prov. Cutervo, Dist. Cujillo, Tambillo, *Jelski* 1053 (GH, US). **Amazonas:** Prov. Bagua, between Aramango and Montenegro, *López et al.* 4223 (GH, HUT). **San Martín:** Mt. Campana, near Tarapoto, *Spruce* 4685 (K, P, W). **Loreto:** Mouth of Río Santiago, Pongo de Manseriche, *Mexia* 6129 (B, F, GH, K, MO, UC, US). Gamitana-cocha, Río Mazán, *J. Schunke* 295 (F, GH, UC, USM). **Pasco:** Pozuzo, Hacienda Ballisteros, *Bryan* 697, 698 (F). **Junín:** Chanchamayo Valley, *C. Schunke* 1344 (F). **Cuzco:** Prov. Paucartambo, Villa Carmen, *Vargas* 11246, 14683 (GH). **Madre de Dios:** Parque Nacional del Manú, *M. Foster* P-84-57, P-84-86 (UC).

18. *Diplazium caracasenum* (Willd.) Moore, Index fil. 324. 1861.

Asplenium caracasenum Willd., Sp. pl. ed. 4, 5: 338. 1810. TYPE: Venezuela, Caracas, *Bredemeyer* (holotype, b!; *Herb. Willd.* 19919; photos, F, GH, US).

Asplenium striatum var. *caracasenum* (Willd.) D. C. Eaton, Mem. Amer. Acad. Arts 8: 206. 1860.

Diplazium shepherdii var. *proliferum* Rosenst., Repert. Spec. Nov. Regni Veg. 7: 294. 1909. SYNTYPES: Peru (San Martín), "in silvis secus flumen Mayo," *Spruce* 4755 (b!, GH!, K!, P!); *Spruce* 4785 (BM!, P!, US!).

Plants terrestrial. **Stem** erect, provided at apex with a few medium to dark brown scales, these

coarse, often sublustrous, 3–6 mm long. **Leaves** 50–90 cm long, 1-pinnate-pinnatifid, petiole naked or with a few dark brown scales at base. **Lamina** 10–20 cm broad, gradually reduced to a pinnatifid apex, glabrous and with scales rare or lacking, bearing a proliferous bud adaxially on the rachis toward the apex. **Pinnæ** 16–20 pairs, all but the distal ones cut 3/4 or nearly to the costa, mostly inequilateral at base, but proximal ones subequilateral, segments subacute, larger ones 2–3 times as long as broad. **Veins** free, pinnately branched in the segments. **Sori** single, or sometimes diplazoid on the basal acroscopic vein branch. **Indusia** thin-textured, dull brown, but sometimes with a very fine white margin.

In forests, usually along streams or in ravines, ca. 700 m, San Martín, Huánuco.

Lesser Antilles; Venezuela; Peru.

Some taxa in the *D. cristatum* complex may not merit species status, as they seem to differ only in the degree of pinna dissection. *D. caracasenum*, however, is distinguished by additional characters, as noted in the key. Furthermore, indusia of the latter often bear a fine white line along the margin, as in the next species, *D. stuebelianum*. This character, a very rare one in the genus, was not noted in the original descriptions of the two species.

Huánuco: Prov. Huánuco, near Tingo María, *Tryon* & *Tryon* 5230 (BM, F, GH, UC, US).

19. *Diplazium stuebelianum* (Hieron.) Stolze, *stat. et comb. nov.*

Diplazium shepherdii var. *stuebeliana* Hieron., *Hedwigia* 47: 212. 1908. LECTOTYPE (designated here): Peru (Amazonas?), between Pacasmayo and Moyobamba, *Stübel* 1072b (b!; photos, F, GH). PARATYPE: Ecuador, between Baños and Jivaria de Pintuc, valle Pastaza, *Stübel* 986 (b!; photos, F, GH).

Plants terrestrial. **Stem** erect to decumbent, provided at apex with dull, medium brown scales, these somewhat flaccid, 3–4 mm long. **Leaves** 42–58 cm long, 1-pinnate-pinnatisect, petiole naked or with a few dark brown scales at base. **Lamina** 8–16 cm broad, gradually reduced to a pinnatifid apex, glabrous and without scales, proliferous buds lacking. **Pinnæ** 10–15 pairs, strongly inequilateral at base, proximal ones (at least) incised nearly to the costa, their basal acroscopic segments free and usually short-stalked. **Veins** free, pinnately branched

in the segments. **Sori** single, or sometimes diplazoid on the basal acroscopic vein branch. **Indusia** thin-textured, dull brown, with a very fine white margin.

In forest and thickets, 1200–1700 m, Amazonas?, Junín, Ucayali.

Ecuador; Peru; Bolivia.

Like several other taxa in the species complex (e.g., *D. lonchophyllum* and *D. werckleanum*), *D. stuebelianum* differs from *D. cristatum* in degree of pinna dissection. However, unlike these others, *D. stuebelianum* is also distinguished by some good qualitative characters. Scales at the stem apex in *D. cristatum* and nearest allies are coarse, blackish, sublustrous, and usually less than 3 mm long, whereas in *D. stuebelianum* they are nearly flaccid, dull brown, and 3–4 mm long. The indusium color is also a very subtle but distinctive character. In fully expanded indusia, there is a very fine, chalky white line along the margin. Indusia of *D. cristatum* are concolorous, although a white-edged margin is often present in *D. caracasenum*.

Junín: Schunke Hacienda, above San Ramón, *C. Schunke* A-189 (US). La Merced, Chanchamayo, *C. Schunke* (A, P). Chanchamayo Valley, *C. Schunke* 112 (US), 729 (F, US). **Ucayali:** Prov. Coronel Portillo, Sinchono, *Aguilar* 892 (GH, USM).

20. *Diplazium cristatum* (Desr.) Alston, *J. Bot.* 74: 173. 1936. **Figure 16a.**

Meniscium cristatum Desr. in Lam., *Encycl.* 4: 94. 1797. TYPE: Martinique, *Joseph Martin* (holotype, P!, Herb. Lamarck).

Asplenium arboreum Willd., *Sp. pl.* ed. 4, 5: 320. 1810. TYPE: Venezuela, Caracas, *Bredemeyer* (holotype, B!, *Herb. Willd.* 19892-1; photos, F, GH).

Asplenium denticulosum Desv., *Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk.* 5: 323. 1811 (not Gaud. 1827). TYPE: "In America calidiore," *Dombey* (holotype; P!; photo, GH).

Asplenium shepherdii Sprengel, *Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur.* 10: 231. 1821. TYPE: Jamaica, *Henry Shepherd* (holotype, L, destroyed; isotype, PH).

Diplazium shepherdii (Sprengel) Link, *Hort. berol.* 2: 70: 1833.

Diplazium arboreum (Willd.) Presl, *Tent. pterid.* 114. 1836.

Diplazium denticulosum (Desv.) C. Chr., *Index fil.* 231. 1905.

Plants terrestrial. **Stem** erect, provided at the apex with a few castaneous to blackish scales,

these coarse, often somewhat lustrous, 1–3 mm long. **Leaves** 25–80 cm long, 1-pinnate-pinnatifid, petiole naked or with a few dark brown scales at base. **Lamina** to 30 cm broad, gradually reduced to a pinnatifid apex, glabrous and lacking scales, proliferous buds absent (or very rarely present). **Pinnæ** 8–12 free pairs, mostly lobed $\frac{1}{4}$ to $\frac{3}{4}$ to the costa (rarely more deeply), inequilateral at base, i.e., cuneate basiscopically, truncate acroscopically, the basal acroscopic lobe or segment much more strongly produced than the opposing basiscopic one, segments obtuse, 1 or 2 times as long as broad. **Veins** free, pinnately branched in the segments. **Sori** commonly diplazioid on the basal acroscopic vein branch, single on the others. **Indusia** thin-textured, dull brown, the margin subentire.

In dense wet or dry forests, often in ravines or along stream banks, 300–1700 m, Amazonas and Loreto to Ayacucho and Madre de Dios.

West Indies; Mexico to Colombia and Venezuela, south to Argentina and Paraguay.

This and near allies form a neotropical species complex that is as taxonomically difficult as that of *Asplenium auritum/cuspidatum*. Because of the variability of leaf dissection it has been divided into a number of species, varieties, and forms. The group is characterized by glabrous, medium-sized, pinnate to pinnate-pinnatisect leaves that taper to a pinnatifid apex, pinnæ with conspicuously inequilateral base (i.e., excavate to cuneate basiscopically, truncate and much more strongly produced acroscopically), and stem apices bearing only a few, small, coarse, blackish scales. With pinnæ deeply lobed to pinnatifid, *D. cristatum* is at the center of the complex. Taxa with entire to shallowly lobed pinnæ are *D. werckleanum* Christ (Mesoamerica), *D. unilobum* (Poir.) Hieron. (West Indies), and *D. bombonasae*. The species *D. lonchophyllum* Kunze (Mesoamerica) and *D. drepanolobium* A. R. Smith (southern Mexico) have pinnæ dissected nearly or quite to the costa. Ultimately, monographic treatment will probably determine that most of these names should be synonyms of *D. cristatum*. Two specimens of the latter seen from Peru could easily key out to *D. werckleanum*, and several others to *D. lonchophyllum* in the keys of Stolze (1981) and other recent neotropical Floras. See *D. bombonasae* and *D. stuebelianum* for further comparisons.

C. Schunke 500 and 944 (F) from Junín, with proximal pinnæ deeply dissected, are practically identical to Central American specimens of *D. lonchophyllum*. Both specimens also bear proliferous

buds distally on the rachis, a condition extremely rare in *D. cristatum* but a diagnostic feature in *D. caracasenum*.

Amazonas: Prov. Bagua, 12 km E of La Peca, *Barbour* 2500 (MO, UC). **San Martín:** River Mayo, near Tarapoto, *Spruce* 4758 (BM, GH, K, US). **Loreto:** "Flumen Marañón inf. fluv. Huallaga," *Spruce* 3911 (K). **Pasco:** Pozuzo, Hacienda Ballisteros, *Bryan* 691, 693 (F). **Junín:** Colonia Perene, *Killip & Smith* 24925 (F, GH, US). **Ucayali:** Prov. Coronel Portillo, Dist. Ipariá, Bosque Nacional de Ipariá, *J. Schunke* V. 2733 (F, GH, US). **Ayacucho:** Prov. San Miguel-La Mar, Teresita, *Barrón* (USM). **Madre de Dios:** Río Manú, Cocha Cashu Station, Parque Nacional del Manú, *Foster et al.* 7197 (F).

21. *Diplazium bombonasae* Rosenst., Repert. Spec. Nov. Regni Veg. 7. 294. 1909. TYPE: Ecuador, Río Bombonasa, *Spruce* (holotype, P!, *Herb. Bonaparte* 10027; photos, GH & US).

Plants terrestrial. **Stem** erect to decumbent, provided at the apex with a few dark brown to blackish scales, these coarse, sometimes sublustrous, 2–3 mm long. **Leaves** 35–65 cm long, 1-pinnate, petiole gray-brown, with a few dark brown scales at the base. **Lamina** to 12 cm broad, firm-herbaceous to chartaceous, gray-green, gradually reduced to a subattenuate, pinnatifid apex, essentially glabrous and lacking scales, lacking proliferous buds. **Pinnæ** 15–24 pairs, approximate to subdistant, falcate, attenuate, conspicuously inequilateral at base (attenuate to excavate basiscopically, truncate acroscopically and with a pronounced basal auricle), basiscopic margins beyond the basal auricle subentire, crenate, or shallowly lobed, or sometimes pinnatifid as to basal pinnæ. **Veins** free, commonly 1–3-forked. **Sori** single or diplazioid, borne on the acroscopic branch of each vein. **Indusia** thin-textured, dull brown, the margins subentire to erose.

In forests, on stream banks or on slopes of ravines, 180–600 m, Loreto, Huánuco, Madre de Dios.

Ecuador; Peru; Bolivia.

As in other taxa related to *D. cristatum*, pinna dissection in *D. bombonasae* can vary widely. Beyond the enlarged basal auricle, pinna margins may be essentially entire throughout the lamina (as in the type), or shallowly to deeply lobed. In deeply lobed pinnæ the acroscopic auricle is sometimes incised nearly to the costa.

South American specimens are sometimes identified as *D. unilobum* (Poir.) Hieron. of the West

Indies, a similar taxon with subentire, but strongly auriculate, pinnae. However, stem scales of the latter are 2–3 times longer, the lamina is lighter in color (yellow-green) and often subcoriaceous, and the petiole and rachis are stramineous. Although monographic study may prove that both taxa are only variants of *D. cristatum*, *D. bombonasa* is tentatively maintained here as a distinct species.

Loreto: Near Río Santiago above Pongo de Manseriche, *Mexia* 6217 (BM, GH, K, MO, UC). **Huánuco:** Prov. Leoncio Prado, Dist. Rupa Rupa, 5 km from Tingo María, *J. Schunke* V. 3267 (F, GH, US). **Madre de Dios:** Prov. Manú, Atalaya, vicinity of Hacienda Amazonia, *Foster & Wachter* 7445 (F, MO).

22. ***Diplazium cuneifolium*** Rosenst., Repert. Spec. Nov. Regni Veg. 12: 470. 1913. TYPE: Bolivia, North Yungas, Polo-Polo near Coroico, *Buchtien* 3390 (holotype, s; isotypes, GH!, F!, US!; photo, BM of s, F, & US of P).

Plants terrestrial. **Stem** erect, provided with coarse, broad, dark gray-brown to blackish scales about 5 mm long. **Leaves** to 80 cm long, 1-pinnate. **Lamina** to 24 cm broad, membranaceous, gradually reduced to a short, pinnatifid apex, lacking scales, sparsely and minutely puberulent on the axes and adjacent tissue abaxially, costae (toward the base) and rachis moderately and minutely puberulent within the adaxial sulci. **Rachis** deeply sulcate adaxially, lacking proliferous buds. **Pinnae** 11–17 pairs, well-spaced, at least proximal ones short-stalked, broadest near the center, narrowly acute at apex, narrowly to broadly cuneate at the subequilateral base, margins lobed about one-quarter to costa, larger pinnae 10–13 cm long and 2–3 cm broad. **Veins** free, pinnately branched. **Sori** borne on most of the vein branches, extending from the costa nearly to the pinna margin, usually diplazioid on the basal branches, the other sori usually single. **Indusia** thin, dull brown, margin subentire to erose or irregularly fimbriate.

In forests, 700–1000 m, Junín, Cuzco, Madre de Dios.

Peru and Bolivia.

This is a rarely collected species, probably confined to lower mountain slopes of Bolivia and the southern half of Peru. In the type collection, pinnae in the proximal half of the lamina have rather narrowly cuneate bases, but in all other specimens examined the pinna bases are much more broadly

cuneate. Considering the variability typical of other species of *Diplazium*, it seems likely that the narrowly cuneate base seen in the type will be a character more exceptional than representative.

Junín: Prov. Satipo, San Francisco de Satipo, *Solomon* 3315 (F, MO). Prov. Satipo, Reserva Forestal de Universidad Central near Satipo, *van der Werff et al.* 8633 (MO, UC). **Cuzco:** Prov. La Convención, Palma Real, *Vargas* 17296 (GH). **Madre de Dios:** Prov. Manú, Atalaya, vicinity of Hacienda Amazonia, *Foster & Wachter* 7447 (F).

23. ***Diplazium grandifolium*** (Sw.) Sw. var. ***andicola*** Stolze, var. nov.

Varietas haec a varietate typica differt indusiis 0.2–0.4 mm latis, tenuibus, brunneolis, planis (nec usque ad 1 mm latis, nec crassis, nec bicoloribus, nec involutis in maturis).

Plants terrestrial. **Stem** erect or decumbent, provided with coarse, broad, blackish scales about 5 mm long. **Leaves** to 1.2 m long, 1-pinnate. **Lamina** to 28 cm broad, firm-herbaceous to chartaceous, gradually to abruptly reduced to a short, pinnatifid apex, lacking scales, glabrous to minutely puberulent on the axes abaxially, rachis and bases of costae puberulent adaxially within the sulci. **Rachis** deeply sulcate adaxially, lacking proliferous buds. **Pinnae** commonly 7–10 pairs, well-spaced, not or shortly stalked, broadest at or near the base, acuminate at the apex, broadly cuneate to truncate at the subequilateral base, margins entire to broadly crenulate, larger pinnae 8–15 cm long and 2–3.5 cm broad. **Veins** free, pinnately branched. **Sori** borne on most of the vein branches, extending from the costa to a few millimeters from the margin, usually diplazioid on the basal acroscopic branch, the other sori single or diplazioid. **Indusia** dull light brown, flat, about 0.2–0.4 mm broad, the margins subentire to erose.

TYPE—Peru, Loreto, Gamitanacocha, Río Mazán, *J. Schunke* 281 (holotype, US!; isotypes, F!, GH!, USM!).

In deep, wet forests, often in ravines, 100–1500 m, San Martín and Loreto to Madre de Dios and Puno.

Venezuela; Ecuador; Peru; Bolivia; western Brazil.

This variety differs from *D. grandifolium* var. *grandifolium* in the delicate, narrow, dull light brown indusia that do not change essentially in color and form, whereas developing and mature

indusia of var. *grandifolium* are strikingly different. Immature sporangia are protected by a broad (often to 1 mm) bicolorous indusium, dark brown to blackish and very firm at its attachment along the vein, but thin and often hyaline toward the margin. As sporangia mature, the indusium rolls back tightly to reveal a dark, usually lustrous, underside. This is nearly identical with the indusium of *D. celtidifolium*, whereas that of var. *andicola* may be compared with *D. centripetale* (Baker) Maxon, of Venezuela, Ecuador and the West Indies.

Diplazium grandifolium var. *grandifolium* is common in the West Indies, and from Central America to Colombia, whereas var. *andicola* is primarily Andean, although a single specimen has been seen from Brazil, near the Peru-Bolivia border. The ranges overlap in Venezuela and Ecuador, where a few specimens of each have been found.

San Martín: Prov. Mariscal Cáceres, Tocache Nuevo, *J. Schunke V. 8489* (F, MO). **Loreto:** Santa Rosa, lower Río Huallaga below Yurimaguas, *Killip & Smith 28911* (US). **Huánuco:** Prov. Huánuco, Tingo María, *Tryon & Tryon 5224* (BM, GH, US). **Pasco** (as Junín): Cahuapanas, on Río Pichis, *Killip & Smith 26781* (US). **Junín:** Chanchamayo Valley, *C. Schunke 142, 451* (F, US). **Ucayali:** Prov. Coronel Portillo, Dist. Iparía, Bosque Nacional de Iparía, *J. Schunke V. 2687* (F, GH, US). **Madre de Dios:** Prov. Tambopata, Tambopata Nature Reserve, *Barbour 4963* (F, MO, UC). **Puno:** Prov. Carabaya, San Gabán, *Vargas 18934* (GH).

Key to Varieties

- a. Rachis and costae glabrous; leaves to 2 m long and 60 cm broad, chartaceous to subcoriaceous; larger pinnae 17–26 cm long, 4–7 cm broad 24a. var. **celtidifolium**
- a. Rachis and costae minutely but densely puberulent; leaves to 1 m long and 35 cm broad, herbaceous; larger pinnae 12–17 cm long, 2.5–3.5 cm broad 24b. var. **puberulum**

24a. *Diplazium celtidifolium* var. *celtidifolium*.

Diplazium callipteris Fée, (Mém. foug. 5) Gen. fil. 214. 1852. PROBABLE TYPE: Venezuela, *Funck & Schlim 233*, in 1845–1846 (holotype, not located; isotype, BM!); originally cited in error as *Linden 233* from Cuba (see discussion above).
Asplenium callipteris (Fée) Baker, Syn. fil. 231. 1867.
Asplenium celtidifolium (Kunze) Baker, Syn. fil. 232. 1867.
Athyrium celtidifolium (Kunze) Milde, Bot. Zeit. (Berlin) 28: 353. 1870.

24. *Diplazium celtidifolium* Kunze, Bot. Zeit. (Berlin) 3: 285. 1845. TYPE: Venezuela, Caracas, *Linden 544* (holotype LZ, destroyed; isotypes, FI, K!, P!; photos, s of FI & K).

Plants terrestrial. **Stem** erect to decumbent, this and petiole base provided with coarse, dark brown, linear or linear-lanceolate scales 4–14 mm long. **Leaves** 1–2 m long, 1-pinnate. **Lamina** 30–60 cm broad, herbaceous to subcoriaceous, terminating in a short, pinnatifid apex, the axes glabrous or densely puberulent and sparsely to amply provided on the abaxial side with flaccid, appressed, brown scales, these mostly linear to filiform, especially abundant on the costae. **Rachis** deeply sulcate adaxially, sometimes bearing proliferous buds at the bases of distal pinnae. **Pinnae** 8–12 pairs, well spaced, conspicuously stalked, long-acuminate at apex, broadly cuneate to truncate at the subequilateral base, margins entire to shallowly crenate-dentate, larger pinnae 12–26 cm long and 2.5–7 cm broad. **Veins** free, pinnately branched. **Sori** borne on most of the vein branches, extending from the costa to about 5 mm from the margin, always diplazioid on the basal acroscopic vein, the other sori single or diplazioid. **Indusia** bicolorous, brown and blackish, at maturity rolled back to the blackish, often lustrous base.

Two varieties are recognized here.

In wet forests, 500–1050 m, Amazonas, San Martín, Puno.
Trinidad; French Guiana; Surinam; Venezuela; Colombia; Peru; Brazil.
There has been confusion in the nomenclature, synonyms, and typification of names associated with *D. celtidifolium*. Apparently Fée erred when citing the type of *D. callipteris* as *Linden 233* from Cuba. During studies of *Diplazium* in Peru, *Linden 233* could not be located. However, there is a

Funck & Schlim 233 from Venezuela (BM), marked as an isotype, that matches the original description in every way. Linden, half-brother to Schlim, collected with him in Venezuela, and it is possible names and numbers became mixed, bringing about Fée's mistake in citing the type. Therefore, if further search does not produce *Linden 233*, the British Museum specimen must be considered at least an isotype. Furthermore, since this specimen does not differ significantly from the type of *D. celtidifolium*, the two names must be synonymous.

A number of specimens from the Lesser Antilles are found in herbaria identified as *D. callipteris*. However, all of these are apparently *D. legalloii* Proctor, a similar species with coarser leaves, usually conspicuously crenate pinna margins, and delicate, light brown indusia.

Amazonas: Prov. Bagua, Montenegro-Chiriaco, *Sagástegui 5923* (GH). **San Martín:** Mt. Guayrapurima, *Spruce 4760* (K, P, US). **Puno:** Prov. Carabaya, San Gabán, *Vargas 18933* (GH).

24b. *Diplazium celtidifolium* var. *puberulum*
Stolze, *var. nov.*

Varietas haec a varietate typica differt foliis usque ad 1 m longis et 35 cm latis, herbaceis, pinnis grandioribus 12–17 cm longis et 2.5–3.5 cm latis, rachidi et costis dense puberulis.

Leaves to 1 m long and 35 cm broad, herbaceous (not chartaceous to subcoriaceous). Larger **Pinnae** 12–17 cm long and 2.5–3.5 cm broad. **Rachis** and **costae** densely puberulent on both sides.

TYPE—Peru, Pasco (as Junín), Pichis Trail, “Yapas” [Yapaz], dense forest, 1350–1600 m, *Killip & Smith 25508* (holotype, US!; isotype, GH!; photos, F & GH of US).

Thus far known only from the type, Pasco, and one paratype, cited below.

Although the most obvious difference between this and var. *celtidifolium* is in the smaller and thinner-textured leaves, this is not merely a depauperate form of *D. celtidifolium*, for it differs also in the puberulent axes. In the typical variety, there is no laminar indument other than the scales on the rachis and costae abaxially; but in var. *puberulum* the axes are densely covered on both sides with minute trichomes about 0.1–0.2 mm long. Such trichomes are found with greater or lesser frequency in others of the species complex, notably such taxa as *D. grandifolium*, *D. centripetale* (Ba-

ker) Maxon of the West Indies and northern South America, and *D. eggersii* Sodiro of Ecuador (the latter most likely conspecific with *D. centripetale*, see **Comments**). This is a character that needs more attention in future monographic work on the genus.

Pasco (as Junín): Pichis Trail, “Yapas” [Yapaz], *Killip & Smith 25457* (us).

25. *Diplazium paucijugum* Stolze, *sp. nov.*

Caulis paleis crassis, nigellis; **folium** usque ad 65 cm longum et 24 cm latum, 1-pinnatum, longipetiolatum, parte apicali pinnatifida circa dimidia longiores quam lamina; rachis et costa in pagina adaxiali paleis flaccidis, appressis, linearibus vel filiformibus; pinnae 2–4-jugatae, apicibus acuminatis, basibus subaequilateribus, truncatis vel subcordatis; venae liberae, pinnatiramosae; indusia crassa, bicoloria, brunnea et nigella, maturitate involuta.

Plants terrestrial. **Stem** erect to decumbent, provided with coarse, broad, blackish scales about 5 cm long. **Leaves** to 65 cm long, 1-pinnate, on a petiole nearly the length of the lamina. **Lamina** to 24 cm broad, firm-herbaceous, the pinnatifid apical portion of the leaf about half the total length of the lamina, essentially glabrous, but axes sparsely puberulent abaxially, to glabrate, also provided on the abaxial side with flaccid, appressed, brown scales, these mostly linear to filiform, especially abundant on the costae. **Rachis** deeply sulcate adaxially, lacking proliferous buds. Free **pinnae** 2–4 pairs at base of lamina, approximate to subdistant, acuminate at apex, truncate to subcordate at the subequilateral base, basal pair short-stalked, margins entire, or basal pinnae broadly crenate, larger pinnae 10–13 cm long, 3.5–4 cm broad. **Veins** free, pinnately branched. **Sori** borne mostly on the basal acroscopic vein branches, extending from near the costa to about 5 mm short of the margin, mostly single, occasionally diplazioid. **Indusia** coarse, bicolorous, brown and blackish, at maturity rolled back to the blackish base.

TYPE—Peru, “In monte Campana, prope Tarpoto, Peruviae Orientalis” (Dept. San Martín), *Spruce 4339* (holotype, K!; isotype, P!; photos, F & GH of K & P).

Thus far known only from the type and one other collection from Huánuco, in jungle on ridge east of Tingo María, 625–1100 m, cited below.

This species is distinguished from others in Peru by the unusual configuration of the lamina. On a

petiole nearly as long as the lamina are borne a few pairs of discrete pinnae, and the rest (half or more) of the lamina is gradually reduced to a prolonged, pinnatifid apex. A similar condition occurs in *D. riedelianum* (Kuhn) C. Chr. of Brazil and (probably a synonym) *D. verapax* (Donn.-Sm.) Hieron. of Mesoamerica. However, those taxa have narrower laminae, much smaller pinnae with cuneate bases and long-tapering tips, and several proliferous buds in the axils of proximal pinnae.

Diplazium paucijugum is closely related to *D. celtidifolium*, especially in the narrow, flaccid scales on the abaxial axes and the glabrous adaxial axes. However, it differs from the latter species especially in the unusual lamina shape, the few and smaller pinnae, the lack of proliferous buds and by the minutely puberulent (to glabrate) axes abaxially. A proliferous bud is often found distally on the rachis in *D. celtidifolium*, and axes are totally lacking in indument except for the abaxial scales on rachis and costae.

Huánuco (as San Martín): E of Tingo María, *Allard* 22334 (GH, US).

26. ***Diplazium roemerianum* (Kunze) Presl, Tent. pterid. 113. 1836. Figure 16b.**

Asplenium roemerianum Kunze, *Linnaea* 9: 62. 1834.

TYPE: Peru, "in argillosis humidis ad Pampayacu" (Pampayacu, Huánuco), *Poeppig* 166, July, 1829 (holotype, B!; isotypes, B!, K!, L, P!; photos, F, GH, MO & US of L).

Asplenium flavescens Mett., *Ann. Sci. Nat. Bot.*, ser. 5, 2: 234. 1864, *sp. nov.* based on Hooker, *Fil. exot. t. 100*. 1859, not *Asplenium juglandifolium* Lam. TYPE: Cultivated at Kew from a Venezuelan plant collected by *Wagener*, this evidently illustrated in *t. 100* (holotype, K; isotype, BM!). PARATYPE: Venezuela, Colonia Tovar, *Fendler* 498 (K). ISOPARATYPE: (GH!). Sloane, *Hist. Jam.* "Filix maxima . . ." 82, *t. 37!* is excluded. Jenman, *Bull. Bot. Dept. Jamaica n.s.* 1(5): 77. 1894 says that the Sloane specimen at BM is a sterile leaf of *Acrostichum cervinum* (= *Olfersia cervina*).

Diplazium flavescens (Mett.) Christ, *Farnkr. Erde* 217. 1897.

Plants terrestrial. **Stem** erect or decumbent, this and the petiole base provided with 3–7 mm long, blackish, linear to lanceolate, subentire scales. **Leaves** to over 1 m long, 1-pinnate, long-petiolate. **Lamina** to 35 cm broad, firm-herbaceous, terminating abruptly in a nearly conform apical segment (this occasionally with a large basal lobe), glabrous, with scattered filiform scales on the rachis. **Pinnae**

2–8 pairs, well-spaced, short-stalked, acuminate at apex, broadly to narrowly cuneate at the subequilateral base, the margins entire to crenulate-serrate. **Veins** 1-forked, free, the branching veinlets spreading from the costa at 50- to 70-degree angles and gently arching to the pinna margin. **Sori** mostly borne on the acroscopic vein branch, thus gently arched like the veinlet. **Indusia** borne mostly along one side (occasionally on both sides) of a veinlet, light to reddish brown, the margins erose to subentire.

In wet forests, 700–2300 m, Loreto and Amazonas south to Cuzco.

Greater Antilles; Guadeloupe; Venezuela; Colombia; Ecuador; Peru; Brazil.

This and *D. flavescens* have been separated on the basis of relative number of pinnae and serrate vs. entire pinna margins: typical *D. flavescens* with 6–8 pairs of pinnae and crenulate margins; *D. roemerianum* with 1–2 pairs of pinnae and entire margins. The two characters are inconsistent, and there are no other significant differences. Pinnae with entire margins are often serrate toward the apex, and when many specimens are compared throughout the range it becomes apparent that margins are highly variable, whether on laminae with few or many pinnae. It would appear that the type of *D. flavescens* simply represents a more robust form of the species.

The Colombian *Asplenium caucense* Karsten and *A. ocanniense* Karsten also surely belong here; however the Central American taxon once classified as *D. flavescens* var. *proliferum* Christ has been recognized (Stolze, 1981) as a quite distinct species, *D. obscurum* Christ.

Amazonas: Prov. Bagua, 12 km E of La Peca, *Barbour* 2647 (F, MO, UC). **San Martín:** Eastern Peru, near Tarapoto, *Spruce* 4674 (BM, P). **Loreto:** Sierra del Pongo, *Mexia* 6273a (GH, K, UC, US). **Huánuco:** Fundo Chela, Sinchono, *Aguilar* 920 (USM). **Pasco:** Pozuzo, Hacienda Ballisteros, *Bryan* 672 (F, US). **Junín:** Chanchamayo Valley, *C. Schunke* 8 (P), 72 (F, US), 73, 802 (F). **Cuzco:** Prov. La Convención, Guayanay, *Vargas* 13238 (GH).

27. ***Diplazium lechleri* (Mett.) Moore, Index fil. 141. 1859.**

Asplenium lechleri Mett., *Fil. lechl.* 1: 16, *t. 2*. 1856.

TYPE: Peru (Puno), "St. Gavan" (San Gabán), "in sylvis montanis," *Lechler* 2269a (holotype, B; isotypes, K!, L; photos, F, GH & US of L, US of K).

Plants terrestrial. **Stem** erect or decumbent, this and the petiole base scaly, the scales 7–12 cm long, dark brown, rigid, linear to lanceolate, attenuate, subentire. **Leaves** to 2 m long, 1-pinnate, long-petiolate. **Lamina** to 35 cm broad, chartaceous to subcoriaceous, terminating abruptly in a conform apical segment, subglabrous, but axes (and sometimes the laminar surface) sparsely provided on abaxial side with filiform scales that grade into dark pluricellular trichomes. **Pinnae** 6–9 pairs, subdistant, short-stalked, acuminate at apex, rounded to cuneate at the subequilateral base (although basal pinnae sometimes narrow-cuneate at the basiscopic base). **Veins** simple, or paired at the costa, straight, spreading at broad (75- to 80-degree) angles, free, except connected at their tips by a slightly inframarginal vein. **Sori** straight, crowded, and strictly parallel, mostly diplazioid. **Indusia** dark brown, firm and persistent.

San Martín to Puno.

Costa Rica; Surinam; Venezuela; Colombia; Peru; Brazil.

This species is easily distinguished by an apical segment that is nearly identical to the lateral pinnae, the crowded, straight sori borne at nearly right angles to the costa, and the mostly simple veins that are free almost to the margin, where they join an inframarginal vein.

San Martín: Mount Guayrapurima, *Spruce* 4687 (κ, ρ). **Huánuco:** SW slope of Río Lluallapichis watershed, ascent of Cerros del Sira, *Dudley* 13085, 13381 (GH). **Junín:** Pichis Trail, Porvenir, *Killip & Smith* 25922 (US). **Cuzco:** Prov. Paucartambo, Cosñipata Valley, Río Tono, *Wachter et al.* 166 (F). **Madre de Dios:** Prov. Manú, Cerro de Pantiacolla, Río Palotoa, *Foster et al.* 10705-A (F).

28. *Diplazium plantaginifolium* (L.) Urban, Symb. antill. 4: 31. 1903.

Asplenium plantaginifolium L., Syst. nat. ed. 10, 2: 1323. 1759. TYPE: *P. Browne*, Jamaica (not located). Proctor, Ferns of Jamaica, p. 394. 1985, designated a (necessary?) neotype: *Maxon* 1949, Jamaica, St. Catharine, Mt. Diablo (us!; isoneo-type, BM!).

Asplenium plantagineum L., Sp. pl. ed. 2: 1537. 1763, nom. superfl. for *A. plantaginifolium* L. and with the same type.

Diplazium plantagineum (L.) Sw., J. Bot. (Schrader) 1800 (2). 62. 1802.

Plants terrestrial. **Stem** erect or decumbent, this and the petiole base sparsely provided with deep

reddish brown or blackish scales, these linear or narrow-deltoid, 1–3 mm long. **Leaves** to 60 cm long, simple, entire to sinuate, or crenate-serrate apically, rarely bearing a proliferous bud at base of lamina. **Petiole** nearly as long as, or longer than, the lamina. **Lamina** to 6 cm broad, glabrous, lanceolate to oblong-lanceolate, acuminate at apex, broadly cuneate to truncate at base. **Veins** spreading from the costa at 50–75 degrees, with 2–4 pairs of strongly ascending branches running parallel with the primary vein, to the leaf margin. **Sori** (many of them) extending nearly from rachis to margin and borne on both sides of a vein. **Indusia** very narrow, delicate and often partly deciduous.

Southern Mexico to Panama; West Indies; Venezuela; Peru; Bolivia; Brazil.

In rain forests, 800–1800 m, Junín.

Only a few American species of *Diplazium* have simple leaves, two of which occur in Peru; but they are easily distinguished by the characters used in the key.

Junín: East of Quimiri Bridge, near La Merced, *Killip & Smith* 23971 (GH, US). Chanchamayo Valley, *C. Schunke* 457 (F).

29. *Diplazium pinnatifidum* Kunze, Linnaea 9: 72. 1834. TYPE: Peru (Huánuco), “In crepidinibus aquosis, lutosus, umbrosissimus,” *Cuchero*, *Poeppig diar.* 1149 July, 1829 (holotype; w!; probably isotype, κ!; photo, BM of w).

Anisogonium pinnatifidum (Kunze) Presl, Tent. pterid. 116. 1836.

Asplenium kunzei Mett., Fil. hort. bot. Lips. 74. 1856, nom. nov. for *Diplazium pinnatifidum* Kunze, and with the same type. Not *Asplenium pinnatifidum* Nutt. 1818.

Plants terrestrial. **Stem** erect or decumbent, this and the petiole base sparsely paleate, the scales 3–4 mm long, dull brown, ovate or lanceolate, commonly subentire, but sometimes with castaneous to blackish marginal cells that develop elongated teeth that are bifid at apex. **Leaves** to 1 m long, mature ones pinnatifid or pinnatisect, often pinnate at base, long-petiolate, juvenile ones subentire to shallowly lobed. **Lamina** to 28 cm broad, coriaceous, tapering gradually to a pinnatifid apex, abruptly reduced at base, cut deeply to the rachis, the rachis and costae usually concealed abaxially by copious, amorphous, brown scales, and sometimes with a few, spreading, dark-toothed ones like

those of the stem. **Segments** 3–7 pairs, joined by an acute to broadly rounded sinus (or the basal 1–2 pairs sometimes fully discrete), the apex obtuse to acute, the surfaces glabrous. **Veins** copiously anastomosing from costa to margin. **Sori** diplazioid, commonly branching to follow the veins. **Indusia** dull brown, narrow, erose to fimbriate, very delicate and early deciduous.

In forests, in wet, shady places, often on hillsides and ravine banks, 250–2500 m, Amazonas and Loreto to Cuzco and Madre de Dios.

Colombia; Ecuador; Peru; Bolivia.

The protologue of *Diplazium pinnatifidum* contains the exact citation of locality and habitat as on the type label (above), except that the former reads “Pampayaco” instead of Cuchero. Both sites are in Huánuco.

The two areolate species of *Diplazium* in Peru not only are easily distinguished by the characters in the key; they differ also in their scales. In *D. praestans* these are filiform and entire; in *D. pinnatifidum* they are broad and often conspicuously dentate, with dark setiform teeth. The areolate venation and these singular scales indicate close relationship with *D. aberrans* Maxon & Morton and *D. pactile* Lell. (Colombia and Ecuador) and *D. chimborazense* (Baker) Christ and *D. macrodictyon* (Baker) Diels (Ecuador). Some authors believe the characters help define a natural species group or subgenus: *Diplazium* subgenus *Anisogonium*.

Diplazium pactile differs from *D. pinnatifidum* in the thin-textured and pubescent leaf tissue; *D. chimborazense* has larger, thinner leaves, attenuate pinnae, and the veins merge only toward the pinna margin. *Diplazium aberrans* differs in its simple, oblanceolate leaves, with petiole short or lacking; *D. macrodictyon* has stellate trichomes on the abaxial surface and veins. Another taxon, *D. fuscum* (Baker) C. Chr. of Ecuador, seems to be merely a robust form of *D. pinnatifidum*; an isotype and two authentic specimens at Kew are like the latter in every respect, except that their larger leaves have six or seven discrete pinnae, one pair of which has lobed margins.

Amazonas: Prov. Bagua, E of La Peca, *Barbour* 2588, 2814 (F, MO, UC). **San Martín:** Mt. Guayrapurima, near Tarapoto, *Spruce* 4686 (B, BM, GH, P). **Loreto:** Pumayacu, between Balsapuerto and Moyobamba, *Klug* 3218 (F, GH, K, MO, US). **Huánuco:** Tingo María, *Tryon & Tryon* 5280 (BM, F, GH, UC, US). **Pasco:** Prov. Oxapampa, Puerto Laguna, *D. Smith* 8448 (UC). **Junín:** Chanchamayo Valley, *C. Schunke* 515 (F, US). **Ucayali:** Prov. Coronel Portillo,

Distr. Calleria, *J. Schunke* V. 3080 (F, GH, US). **Cuzco:** Santa Isabel, Valle Cosñipata, *Scolnik* 930 (US). **Madre de Dios:** Prov. Manú, Cerro de Pantiacolla, *Foster et al.* 10718 (F).

30. ***Diplazium praestans*** (Copel.) Morton, Contr. U.S. Natl. Herb. 38: 41. 1967.

Athyrium praestans Copel., Amer. Fern J. 38: 132. 1948. TYPE: San Martín, Chazuta, Río Huallaga, *Klug* 4002 (holotype, us!; isotypes, F!, GH!, MO!, P!, UC!).

Plants terrestrial. **Stem** erect or decumbent, occasionally short-creeping, provided with medium to dark brown, filiform scales, these 2–3 mm long and only several cells broad, their margins entire. **Leaves** to 35 cm long, simple, entire to broadly sinuate, lacking a proliferous bud. **Petiole** 0–5 cm long, with scales like those of the stem, but longer and broader. **Lamina** to 9 cm broad, glabrous, elliptic to (commonly) oblanceolate, subacute at apex, long-attenuate at base. **Veins** copiously anastomosing. **Sori** linear, gently arching, up to 5 cm long, mostly single (rarely double). **Indusia** narrow, firm, persistent.

In dense forests, in wet places in deep shade, often along banks of rivers and streams, 100–900 m, San Martín and Loreto to Junín and Madre de Dios.

Peru; Bolivia; Amazonian Brazil.

Another species with simple leaves and copiously anastomosing veins is *Diplazium aberrans* Maxon & Morton of Colombia and Ecuador, but this differs from *D. praestans* in its larger (to 60 cm) leaves and longer and narrower areoles. It differs even more significantly in its peculiar scales, which are borne along the costa, and sometimes veins, abaxially, as well as on the stem and petiole. These scales (at least of the stem) have castaneous to blackish marginal cells that develop elongated, bifid teeth. Scales on *D. praestans* (confined to the stem and petiole) are entire and concolorous. For further discussion of these scales see *D. pinnatifidum*.

San Martín: Prov. Mariscal Cáceres, Distr. Campanilla, Quebrada de Mashuyacu, *J. Schunke* V. 4250 (F, GH, US). **Loreto:** Río San Alejandro, *Woytkowski* 5118 (GH, MO, UC, US). **Huánuco:** Prov. Leoncio Prado, Río Monzón, near Bella, *Plowman* 5875 (GH). **Junín:** Río Pinedo, N of La Merced, *Killip & Smith* 23621 (GH, US). **Ucayali:** Prov. Coronel Portillo, Distr. Iparia, Bosque Nacional de Iparia, *J. Schunke* V. 2752 (GH, US). **Madre de Dios:**

Prov. Manú, Parque Nacional Manú, R. Foster 11722 (F).

Comments

Diplazium centripetale (Baker) Maxon, Pteridophyt. Porto Rico 441. 1926.

Asplenium centripetale Baker, Syn. fil. ed. 2: 490. 1874. LECTOTYPE (designated by Proctor, Ferns of Jamaica): Jamaica, *Macfayden* (K).
Asplenium eggersii Sodiro, Crypt. vasc. Quit. 188. 1893. TYPE: Ecuador, between Bodegas and Balsapamba, *Sodiro*, (holotype, not located; probable isotype, P!; frag., US!; photos, F & US of P).
Diplazium eggersii (Sodiro) C. Chr., Index fil. 231. 1905.

This is very similar to *D. celtidifolium* var. *puberulum*, especially in the pinna size and the puberulent axes. It occurs in the West Indies, Venezuela, and Ecuador, and might be expected in Peru. The most obvious differences from the latter species are in the characters of sori and pinnae. In *D. centripetale*, sori extend only halfway to $\frac{3}{4}$ to the pinna margin, and indusia are thin, flat, and dull light brown throughout. The 15–25 pairs of pinnae are commonly sessile. In *D. celtidifolium*, sori extend from the costa to within 5 mm of the pinna margin, and indusia are firm, bicolorous (brown distally and blackish proximally), and at maturity are rolled back to the blackish, often lustrous, base. There are only 8–12 pairs of pinnae, most of which are conspicuously stalked.

In the protologue, the type of *Asplenium eggersii* was said to be collected in Ecuador, between Bodegas and Balsapamba. Thus far no specimen has been found exactly designating this locality. However, there are two sheets at Paris collected by Sodiro in January, 1891 “in reg. tropic. inter Bodegas et Pisagua,” one of which is inscribed in Sodiro’s hand as “Asplen. (Dipl.) eggersii, Nov. Sp.” Given the confusion that usually attends Sodiro specimens, descriptions, and type localities, this is likely to be an isotype (if not the holotype) of the name. In any case, these specimens at Paris, and other Ecuador collections made in adjacent areas and determined as *D. eggersii*, quite match specimens of *D. centripetale* from the West Indies.

Key to Species of *Athyrium*

- a. Lamina 2-pinnate to 2-pinnate-pinnatifid; ultimate segments rather sharply dentate 1. **A. dombeyi**
- a. Lamina 4- to 5-pinnate; ultimate segments entire and elongate, bifid, or lobed .. 2. **A. ferulaceum**

XVII. *Athyrium*

Athyrium Roth, Tent. fl. germ. 3: 58. 1799. TYPE: *Athyrium filix-femina* (L.) Roth (*Polypodium filix-femina* L.). **Figure 17.**

Stem usually decumbent to nearly erect, usually short-creeping and moderately stout, or long-creeping and slender, bearing scales, these not or obscurely clathrate, brown, concolorous. **Leaves** ca. 20 cm to 2 m long, petiole continuous. **Lamina** 1-pinnate-pinnatifid to 5-pinnate, nearly glabrate, somewhat scaly, or slightly pubescent or glandular, monomorphic or nearly so. **Veins** free. **Sori** roundish or usually elongate on one side of a vein, or sometimes also on the other side distally, not paraphysate, usually covered by reniform to elongate or hook-shaped indusia, or essentially exindusiate. **Spores** rather ellipsoidal, monolete, variously ridged.

Athyrium is a large genus of about 100 species, most of them in eastern and southeastern Asia. There are two species in the Andes and in Peru.

The genus is technically separated from *Diplazium* by its chromosome number of $n = 40$ or multiples, and the indusia either only on one side of a vein, or if on the other side then only distally and continuous around the apex of the sorus. *Diplazium* has a chromosome number of $n = 41$ and multiples, and usually some sori are on both sides of a vein and distinct distally.

Athyrium ferulaceum and related species of Central America are placed here on the basis of the chromosome number of $n = 40$ (Gómez, Atti Ist. Bot. Univ. Pavia 7: 30. 1971, as “*Athyrium bradeorum*”) (= *Diplazium bradeorum*), and the indusia that are commonly only on one side of a vein, or rarely partly on the other side and continuous distally. The group is of uncertain affinity and the spores resemble species of *Diplazium* more than those of *Athyrium*. However, it seems closer to *Athyrium* in its chromosome number and more obvious characters.



FIG. 17. *Athyrium dombeyi*: a, habit; b, pinnule, abaxial side. (From Tryon & Tryon 6029, Columbia, GH.)

1. *Athyrium dombeyi* Desv., Mém. Soc. Linn. Paris 6: 266. 1827. (as *dombei*). TYPE: "Peruvia (Herb. Mus. Paris)," presumably Peru, *Dombey* (holotype, P). Figure 17a–b.

Stem stout, decumbent to erect, bearing brown to dark brown, elongate scales. **Leaves** ca. 20 cm to 1 m long, the petiole mostly glabrous except for usually persistent scales near the base. **Lamina** 2-pinnate to 2-pinnate-pinnatisect, glabrous or very slightly scaly, pinnae sessile to usually short-stalked, the basal usually somewhat reduced, ultimate segments rather sharply dentate. **Sori** more or less elongate, on one side of a vein, rarely some on the other side distally, covered by an indusium of similar extent.

In ravines, on damp banks, along streams, and at the edge of aqueducts, 2500–3300 m, Lambayeque to Cuzco.

In South America southward to southeastern Brazil and Argentina; perhaps also northward to Central America, Mexico, and Hispaniola.

Athyrium dombeyi is a member of the *Athyrium filix-femina* complex which is mostly temperate and boreal in distribution and it is perhaps a variety of that species: *Athyrium filix-femina* var. *dombeyi* (Desv.) Hieron.

Lambayeque: Prov. Ferreñafe, 4 km NW of Incahuasi, *Dillon & Skillman* 4157 (F, GH). **Cajamarca:** Prov. Cajamarca, Dist. Encañada, *Sánchez* 318 (GH). **Amazonas:** Prov. Bagua, E of La Peca, *Barbour* 2759 (F). **La Libertad:** Prov. Otuzco, above Agalpampa, *Saunders* 894 (GH), 895 (F, GH). **San Martín:** Dist. Huallaga, 30 km above Jucusbamba, *Hamilton & Holligan* 929 (US). Prov. Mariscal Cáceres, between Mirador and La Playa, *Young & León* 4932 (F). **Ancash:** Above Yungay on road to Huanaguanuco, *Correll & Smith* P963 (GH). **Huánuco:** Muña, *Macbride* 4327 (F, US). Cani, *Macbride* 3404 (F, US). **Cuzco:** Prov. Paucartambo, vicinity of Achirani, *Vargas* 11139 (F, UC).

2. *Athyrium ferulaceum* (Hooker) Christ, Bull. Herb. Boissier, ser. 2, 4: 968. 1904.

Asplenium ferulaceum Hooker, Sp. fil. 3: 216. 1860. SYNTYPES: Colombia (New Grenada), *Hartweg* 1519; Ecuador, Quito, *Jameson* (both K). *Diplazium ferulaceum* (Hooker) Lell., Proc. Biol. Soc. Wash. 98: 376. 1985.

Stem small to stout, decumbent to erect, bearing broad, brown scales, especially at the apex. **Leaves** ca. 30 cm to 1 m long, the petiole essentially glabrous. **Lamina** 4–5 pinnate, glabrous or nearly so,

pinnae sessile to short-stalked, the basal the largest, ultimate segments entire and elongate, bifid, or lobed. **Sori** elongate, on one side of a vein, rarely some on the other side distally, covered by an indusium of similar extent.

A single collection known from Peru: in humus, 1450 m, Cuzco. Elsewhere in forests, on ravine banks, and rarely on sandstone cliffs, 100–2700 m. Central America south to Peru.

Cuzco: Prov. La Convención, Choquellwanca, *Vargas* 12928 (GH).

XVIII. Hemidictyum

Hemidictyum Presl, Tent. pterid. 110. 1836. TYPE: *Hemidictyum marginatum* (L.) Presl (*Asplenium marginatum* L.). Figure 18.

Stem erect to decumbent, stout, bearing scales. **Leaves** ca. 1 to 3 m (or more) long, petiole continuous. **Lamina** 1-pinnate, the pinnae entire, glabrous. **Veins** free near the costas, fully anastomosing toward the margin, without included free veinlets, the vein ends connected by a marginal vascular strand. **Sori** elongate along the veins, not paraphysate, covered by elongate indusia. **Spores** rather ellipsoidal, monolete, prominently ridged or saccate.

Hemidictyum is a monotypic, morphologically and cytologically isolated genus of the American tropics. The chromosome number of $n = 31$ may raise doubts as to its proper inclusion in the Dryopteridaceae, which have $n = 40$ or 41. However, in other characters, the alliance of the genus seems to be with that family and with the Tribe Physematiceae.

1. *Hemidictyum marginatum* (L.) Presl, Tent. pterid. 111. 1836. Figure 18a–c.

Asplenium marginatum L., Sp. pl. 1082. 1753. TYPE: Either LINN 1250.20 or Petiver, Pteri-graph. Amer. t. 12, f. 2, both of which are this species, the latter based on Plumier, Traité foug. Amér. t. 106.

Stem apex densely scaly, with brown, linear scales. **Leaves** ca. 1 to 3 m (or more) long, the petiole glabrous or somewhat scaly near the base. **Lamina** 1-pinnate, with a conform apical segment,



FIG. 18. *Hemidictyum marginatum*: a, leaf apex; b, portion of pinna, abaxial side; c, pinna margin, adaxial side. (From Stolze, Ferns & fern allies of Guatemala, 1981.)

pinnae large, entire, thin. **Veins** with the ends connected by a nearly marginal vascular strand. **Sori** elongate, often very long, borne along part of a free vein, toward the costa from the anastomosing veins, indusium of similar extent, very thin.

Steep banks in forests, in dense forests and in cloud forests, 260–1700 m, Amazonas to Ucayali.

Southern Mexico and the Greater Antilles, south to Bolivia and southeastern Brazil.

Amazonas: Prov. Bagua, Quebrada Miraná, Río Marañón, above Cascadas de Mayasi, *Wurdack* 1890 (GH, US). Prov. Bagua, 12 km E of La Peca, *Barbour* 2582 (MO). **San Martín:** Tarapoto, *Spruce* 4783 (GH, US). Chazuta, Río Huallaga, *Klug* 3932 (GH, US). **Loreto:** Between Río Amazonas and Río Napo, *Croat* 19556 (MO). **Huánuco:** Prov. Huánuco, Tingo María, *Tryon & Tryon* 5254 (GH, US). Prov. Huánuco, Gasa, *Stork & Horton* 9874 (F, US). **Pasco:** Pichis Trail, Eneñas, (as Junín), *Killip & Smith* 25765 (F, US). Prov. Oxapampa, Paujil, *León* 285 (USM). Prov. Oxapampa, Villa Rica, *van der Werff et al.* 8304 (MO). **Junín:** Near La Merced, *Killip & Smith* 23875 (F, GH, US). Near Perené Bridge, *Killip & Smith* 25291 (F, US). **Ucayali:** Prov. Coronel Portillo, La Divisoria, (as Loreto), *J. Schunke V.* 10199 (F, MO, US). **Madre de Dios:** Prov. Manú, Cocha Cashu uplands, *Núñez* 5841 (MO).

XIX. *Cystopteris*

Cystopteris Bernh., Neues J. Bot. (Schrader) 1(2): 26. 1806, *nom. conserv.* TYPE: *Cystopteris fragilis* (L.) Bernh. (*Polypodium fragile* L.). **Figure 19.**

Stem short and decumbent to rather long-creeping, bearing scales. **Leaves** ca. 10–80 cm long, petiole continuous. **Lamina** 2-pinnate to 3-pinnate-pinnatifid, glabrous, glandular or slightly pubescent, monomorphic. **Veins** free. **Sori** round, borne on the veins, not paraphysate, more or less covered by scalelike to half-cup shaped indusia. **Spores** rather ellipsoidal, monolete, echinate, verrucate, slightly rugose, or with inflated processes.

Cystopteris is a small genus of about six species, nearly worldwide in distribution, with a single species, *C. fragilis*, in the American tropics. The Andean *Cystopteris* is highly variable and may eventually be classified as various taxa representing different cytotypes. At this time it seems best to treat it as a single species. Blasdell's interpretation of variation in *C. fragilis* as being due to widespread hybridization seems to lack evidence and merit; accordingly the morphological variations

are treated as within the natural variation of one species.

There are two subgenera, *Cystopteris* (including *C. fragilis*) and subgenus *Acystopteris* (Nakai) Blasdell, the latter often recognized as a genus.

Reference

BLASDELL, R. F. 1963. A monographic study of the fern genus *Cystopteris*. Mem. Torrey Bot. Club, 21(4): 1–102.

1. *Cystopteris fragilis* (L.) Bernh., Neues J. Bot. (Schrader) 1(2):27, t. 2, f. 9. 1806. **Figure 19a–b.**

Polypodium fragile L., Sp. pl. 1091. 1753. TYPE: Plunkenet, Phytographia t. 180, f. 5. 1691.

Cystopteris translucens Desv., Mém. Soc. Linn. Paris 6: 264. 1827. TYPE: Peru, (holotype, P, Herb. Desvaux; photos, GH, US).

Athyrium fumaroides Presl, Reliq. haenk. 1: 39, t. 6, f. 2. 1825. TYPE: Peru, *Haenke* (holotype, PR or PRC).

Stem scales light to dark brown, usually rather broad. **Leaves** ca. 10–50 cm long, the petiole usually glabrous, sometimes slightly scaly. **Lamina** 1-pinnate-pinnatisect to 3-pinnate-pinnatifid, gradually reduced at the apex, essentially glabrous, pinnae nearly sessile to short-stalked, the basal somewhat reduced or not. **Veins** free. **Sori** roundish, borne on the veins, covered by a basally attached, scalelike indusium, its apex often somewhat elongate.

Usually in rocky, locally moist places: on ledges, in crevices of rocks, on rock walls, and on rocky roadside banks, also along streams, on shrubby hillsides, and banks of irrigation ditches, rarely in wet forests or rarely epiphytic, 300–4500 m, Cajamarca to Puno. This is a widely distributed species in Peru, especially at 3000–3500 m; the lowest altitude for the species, 300–700 m, is on the Lomas de Atiquipa, Department of Arequipa.

Widely distributed in both hemispheres; primarily montane in the tropics.

Cajamarca: Arriba de Incahuasi, *Sagástegui et al.* 12894 (F, GH, HUT). Prov. Contumazá, Lledén, *Sagástegui* 9392 (MO). **Amazonas:** Río Ventilla, near Molinopampa, *Wurdack* 1548 (GH, US). **La Libertad:** Prov. Santiago de Chucó, Motil to Shorey, *Saunders* 891 (F, GH). Prov. Sanchez Carrión, Huayllides, *D. Smith* 2275 (MO). **Ancash:** Prov.



FIG. 19. *Cystopteris fragilis*: a, habit; b, pinnule, abaxial side. (Adapted from Stolze, Ferns & fern allies of Guatemala, 1981.)

Huaylas, Huascarán National Park, *Smith et al.* 9786 (F). Prov. Bolognesi, Chiquián, *Mostacero et al.* 1342 (MO). **Huánuco:** Chaglla, *Macbride* 3638 (F, GH, US). **Lima:** Viso, *Macbride & Featherstone* 613 (F, US). Prov. Canta, Dist. Huamantanga, *Saunders* 1149 (F, GH). Prov. Yauyos, Tupe, *Cerrate* 1071 (USM). **Pasco:** Prov. Oxapampa, Cordillera de Yanachaga, *van der Werff et al.* 8470 (MO, UC). **Junín:** Prov. Tarma, 5 km SW of Huacapistana, *Tryon & Tryon* 5432 (GH, US). **Huancavelica:** Entre Conaica y Manta, *Tovar* 827 (GH). **Ayacucho:** Nasca to Puquio, *Correll & Smith* P156 (GH). **Apurímac:** Prov. Abancay, *Vargas* 2296 (UC). **Cuzco:** Prov. Cuzco, between Cuzco and Sagsaywamán, *Stevens* 22070 (F, MO). Machu Picchu, *León* 465 (USM). Yuca, *Coronado* 144 (GH). **Arequipa:** Lomas de Atiquipa, *Coronado* 37 (GH, UC, US); ca. 100 km N of Arequipa, *Treacy* 694 (GH). **Puno:** 10 km from Puno, *Correll & Smith* P187 (GH).

XX. *Woodsia*

***Woodsia* R. Br., Prodr. 158. obs. IV sub *Alsophila*.** 1810, as *Woodia*; also and corrected in *Trans. Linn. Soc. London* 11: 171–174. 1815. TYPE: *Woodsia ilvensis* (L.) R. Br. (*Acrostichum ilvense* L.). **Figure 20.**

Stem decumbent to erect, usually small and short-creeping, bearing scales. **Leaves** ca. 5–50 cm long, the petiole joined in a few (not South American) species. **Lamina** 1-pinnate or 1-pinnate-pinnatisect or rarely to 2-pinnate-pinnatifid, glabrous, glandular, scaly, and/or pubescent. **Veins** free. **Sori** roundish, borne on the veins, not paraphysate, more or less covered by an indusium surrounding the receptacle that is globose, or of a few large segments, or of a few trichomelike cilia. **Spores** ellipsoidal to spheroidal, monolete, with short to long winglike ridges and somewhat echinate.

Woodsia is mostly a circumboreal genus of about 25 species, with a single species in South America and Peru.

Reference

BROWN, D. F. M. 1964. A monographic study of the fern genus *Woodsia*. *Beih. Nova Hedwigia*, 16: 1–154.

1. ***Woodsia montevidensis*** (Sprengel) Hieron., *Bot. Jahrb. Syst.* 22: 363. 1896. **Figure 20a–d.**

Dicksonia montevidensis Sprengel, *Syst. veg.* ed. 16, 4: 122. 1827. TYPE: Uruguay, “Monte Video,” *Sello* (a specimen at B is authentic).

Cheilanthes crenata Kunze, *Linnaea* 9: 84. 1834. TYPE: Peru, (Huánuco), Huánuco, *Poeppig in* 1830 (holotype, LZ, destroyed; isotype, not located).

Woodsia peruviana Hooker, *Sp. fil.* 1: 61, t. 21B. 1844. TYPE: Peru, (Lima), Huamantanga, *Mathews* 602 (holotype, K; isotype, GH!).

Woodsia crenata (Kunze) Hieron., *Bot. Jahrb. Syst.* 34: 440. 1904.

Stem with light brown to dark brown, usually broad scales. **Leaves** ca. 8–40 cm long, the petiole glabrous or often slightly; scaly, especially at the base. **Lamina** 1-pinnate-pinnatifid to usually 1-pinnate-pinnatisect, rarely 2-pinnate-pinnatifid, gradually reduced at the apex, glandular-pubescent and pubescent, pinnae sessile or nearly so, the basal ones reduced. **Veins** free. **Sori** roundish, borne on a vein, at first covered by a nearly globular indusium that later splits into segments.

In rocky places, on cliffs, in crevices of rocks, at the bases of large rocks, or on Inca walls, also on brushy rocky slopes, on pastured hillsides, grassy slopes, or stream banks, rarely in wet woods or on wooded hillsides, 200–4300 m, Lambayeque to Arequipa and Puno. The species grows at 200–600 m on coastal lomas and usually at 3000–4000 m in the Altiplano.

Hispaniola; Venezuela and Colombia, south to Argentina and to southeastern Brazil; southern Africa.

Woodsia motevidensis is a highly variable species in the size of the lamina and the extent to which the margin is flat or revolute. At high altitudes, especially in exposed sites, the leaves may be less than 10 cm long and the ultimate segments have revolute margins. Especially on lomas, which are mostly cloudy and foggy during the growing season, the leaves may be to 40 cm long and the ultimate segments of the lamina are expanded and flat.

Lambayeque: 42 km from Olmos on road to Jaén, *Correll & Smith* P816 (GH). **Cajamarca:** Prov. Contumazá, arriba de Contumazá, *López et al.* 3713 (F, GH). Prov. Contumazá, alrededores de Guzmango, *Sagástegui* 9675 (MO). **La Libertad:** Lomas de Virú, *Coronado* 284 (GH, UC), *López et al.* 3638 (GH). **Ancash:** Lomas de Mongón, *Coronado* 299 (GH). Cerro al E de Chiquián, *Ferreira* 7343 (GH). **Huánuco:** Piedra Grande, *Macbride* 3671 (F, GH, US). Muña, *Woytkowski* 5252 (GH, MO). **Lima:** Loma de Amancaes, *Tryon & Tryon* 5215 (F, GH, US), *Coronado* 12 (MO). Matucana, *Macbride & Featherstone* 427 (F, US). **Junín:** Near Huancayo, *Killip & Smith* 22127 (GH, US). Huacapistana, *Cerrate* 2884 (GH). Huancayo, *Soukup* 3549 (MO). **Huancavelica:** Entre Colcabamba y Paucarbamba, *Tovar* 2008 (GH). **Ayacucho:** Be-

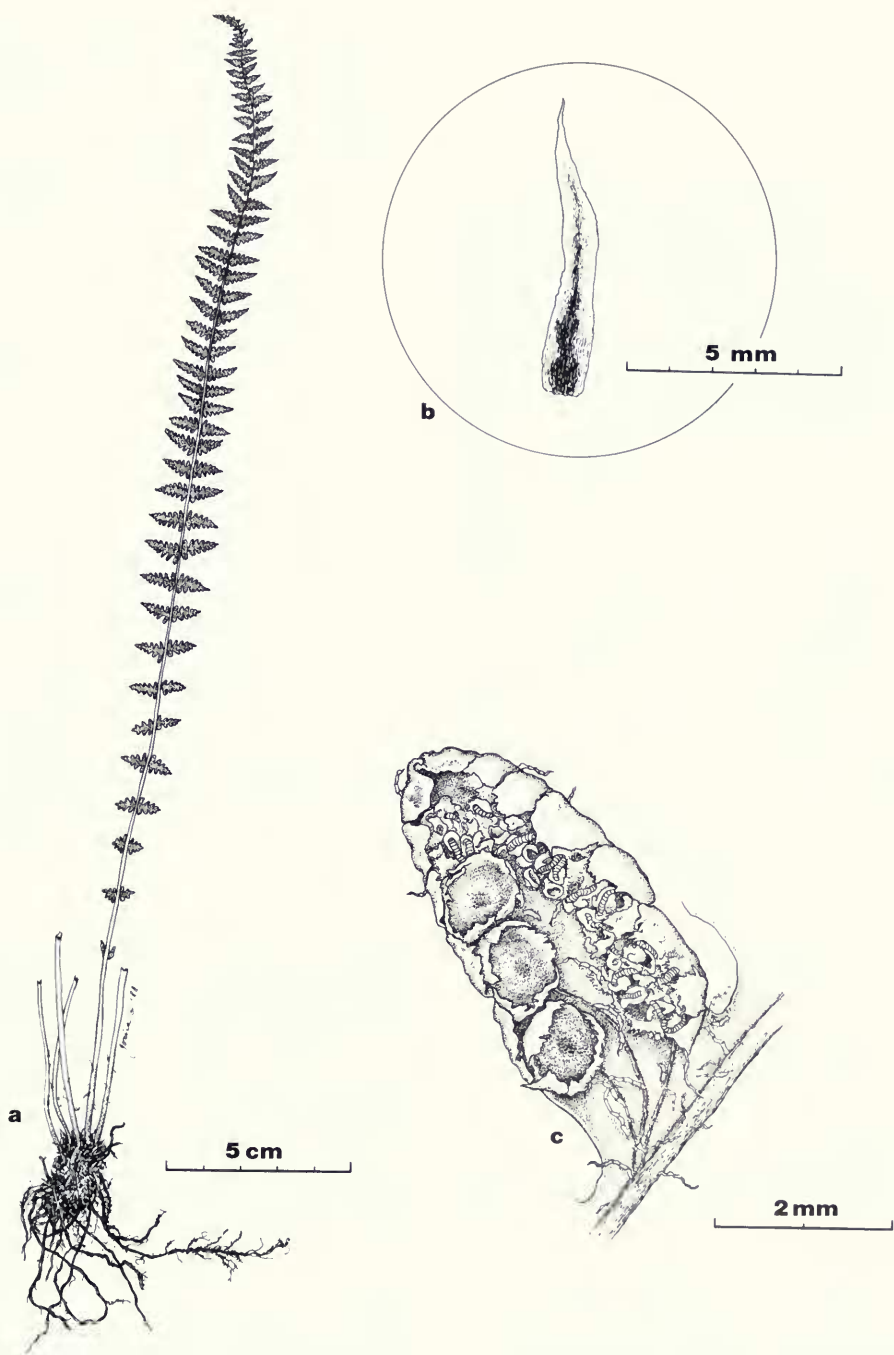


FIG. 20. *Woodsia montevidensis*: a, habit; b, stem scale; c, pinna segment, abaxial side. (From Bryan 375, F.)

tween Huanta and Río Apurímac, Killip & Smith 22485 (GH, US). **Apurímac:** Prov. Aymaraes, Dist. Cotarosi, Saunders 775 (GH). **Cuzco:** Machu Picchu, Tryon & Tryon 5402 (GH, US), Coronado 96 (GH, UC, US). Prov. Calca,

Amparaes, Núñez 6642, 6649 (MO). Slopes of Sicuani, Vargas 9831 (F, GH, UC). **Arequipa:** Arequipa, Pennell 13197 (GH, US). **Puno:** Puno, Graja Salcedo, Mexia 7781 (GH, UC, US). Chucuito, Coronado 165 (GH, UC).

XXI. *Oleandra*

Oleandra Cav., *Anales Hist. Nat.* 1:115. 1799.
TYPE: *Oleandra neriiformis* Cav. **Figure 21.**

Stem erect and branching, or climbing and long-creeping, slender, to 5 m long, bearing scales. **Leaves** ca. 10–50 cm long, petiole articulate. **Lamina** simple, entire, glabrate, pubescent, and/or scaly, monomorphic or very rarely dimorphic. **Veins** free. **Sori** roundish, borne on the veins, not paraphysate, covered by a reniform to peltate indusium. **Spores** rather spheroidal, monolete, more or less prominently ridged and echinate.

Key to Species of *Oleandra*

- a. Stem widely creeping, its scales spreading; phyllopodia mostly 5–30 mm long, naked, like the petiole above the joint; lamina and indusia glabrous 1. *O. articulata*
- a. Stem ascending, erect or climbing, its scales closely appressed b
- b. Lamina glabrous or with some scales, mostly 1–2 cm wide, rarely some to 2.5 cm or less than 1 cm wide; phyllopodia mostly 10–20 cm long, or some as short as 3 mm, or as long as 30 mm, naked, like the petiole above the joint; indusia glabrous 2. *O. lehmannii*
- b. Lamina pubescent, at least in part, especially on or near the costa, mostly 3–3.5 cm wide, rarely some 2 cm or more than 3.5 cm wide; phyllopodia 1–3 mm long, or some to 6 mm long, at first scaly, like the stem; indusia slightly pubescent on the surface and with ciliate margins 3. *O. pilosa*

1. *Oleandra articulata* (Sw.) Presl, *Tent. pterid.* 78. 1836. **Figure 21a–b.**

Aspidium articulatum Sw., *J. Bot. (Schrader)* 1800(2): 38. 1802. TYPE: Martinique, Plumier, *Traité foug. Amér. t. 136.*
Aspidium nodosum Willd., *Sp. pl. ed. 4, 5:* 211. 1810, *nom. superfl.* for *Aspidium articulatum* and with the same type.
Oleandra nodosa Presl, *Tent. pterid.* 78. 1836, *nom. nov.* for *Aspidium nodosum* Willd. and with the same type.

Stem widely creeping, with spreading, usually widely spreading, scales. **Phyllopodia** 5–30 mm long, slender, without scales. **Lamina** glabrous, ca. 15–40 cm long and 2.5–8 cm wide. **Indusia** glabrous.

Epiphytic in dense forests or cloud forests, 1330 to ca. 1700 m, Huánuco, pasco, and Junín.
Guatemala to Panama; West Indies; northern South America south to Peru and northern Brazil; Cocos and Galápagos Islands.

Oleandra is a pantropical genus of about 35 species. There are at least six species in America and three in Peru. It is one of the few ferns that have some species with an erect, branched stem that results in a shrublike habit.
The petiole is articulate and the portion of it below the joint is called a phyllopodium.

Reference

MAXON, W. R. 1914. The American species of *Oleandra*. *Contr. U.S. Natl. Herb.*, 17: 392–398.

Rarely the scales of the stem are mostly only slightly spreading, rather than widely spreading.
Maxon chose Plumier *t. 136*, the only element included in the original publication of *Aspidium articulatum* Sw., as the type of the name. He investigated material from Mauritius, included in *Aspidium articulatum* later by Swartz (*Syn. fil.* 42, 236. 1805) in the Swartz herbarium, Stockholm, and decided that it could not be type material of *Aspidium articulatum*. Morton (*Amer. Fern J.* 58: 105–107. 1968) reached a contrary conclusion and applied the name *Aspidium nodosum* to the American species and *Aspidium articulatum* to the species of Africa and adjacent islands. Joncheere (*Taxon* 18: 538–541. 1969) argued persuasively that Maxon’s original typification was correct and we confidently agree with his conclusion. The correct name for the African species is *Oleandra distenta* Kunze (*Pic.-Ser., Webbia* 20: 755. 1965).

Huánuco: Río Lullapichis watershed, ascent of Cerros del Sira, *Dudley 13243* (GH). **Pasco:** Pichis Train, Eneñas (as Junín), *Killip & Smith 25756* (F, NY, US). Prov. Oxa-

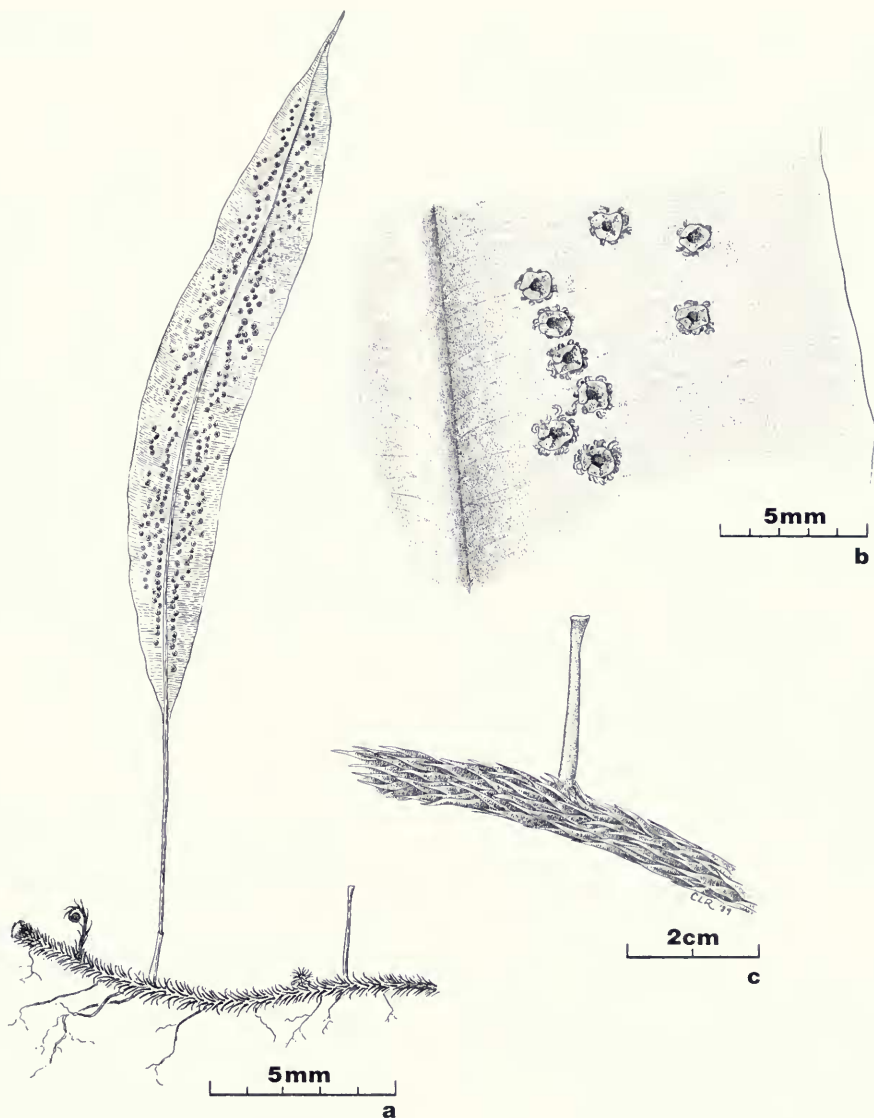


FIG. 21. *Oleandra articulata*: a, habit; b, portion of lamina, abaxial side. *Oleandra lehmannii*: c, stem and phyllopodium. (a, b from Ollgaard & Balslev 9085, Ecuador, F; c from D. Smith 5395, F.)

pampa, Cordillera San Matías, León 313 (GH, USM).
Junín: Above San Ramón, Killip & Smith 24878 (NY, US).

2. *Oleandra lehmannii* Maxon, Contr. U.S. Natl. Herb. 17: 395. 1914. TYPE: Colombia, Antioquia, above Amalfi, Lehmann XLII (holotype, US!; isotype, K!; photo, GH). Figure 21c.

Stem ascending to erect and climbing, with closely appressed scales. **Phyllopodia** (3–)10–

20(–30) mm long, mostly slender, without scales. **Lamina** glabrous or with some scales, ca. 10–30 cm long and 1–2(–2.5) cm, rarely less than 1 cm, broad. **Indusia** glabrous.

Epiphytic or rarely terrestrial in rich organic matter, montane rainforests, elfin forests, rarely in *Sphagnum* bogs, 1480–2500 m, Huánuco and Pasco.

Colombia south to Peru; northern Brazil.

Huánuco: Río Llullapichis watershed, ascent of Cerros del Sira, *Dudley* 13306B, 13453, 13489 (GH), 13554 (GH, US). **Pasco:** Pichis Trail, Dos de Mayo (as Junín), *Killip & Smith* 25870 (F, GH, NY, US). Prov. Oxapampa, 20 km W of Oxapampa, *D. Smith* 5395 (GH). Chontabamba, *León et al.* 968 (F, GH).

3. *Oleandra pilosa* Hooker, Gen. fil. t. 45B. 1840. TYPE: "British Guiana," Berbice, *Schomburgk* 416 (holotype, K!; photo, GH).

Aspidium pendulum Splitg. Tijdschr. Natuurl. Gesch. Physiol. 7: 412, 1840, not Raddi, 1819. SYNTYPES: Surinam, Berlijn plantation, *Splitgerber* (L; photo, GH); *Schomburgk* 416 (K, L; photo GH of K).

Oleandra micans Kunze, Bot. Zeit. (Berlin) 9: 346. 1851. TYPE: Peru, (San Martín), Mission Tocache, (sterile), *Poeppig* Jul. Aug. 1830 (*Diar.* 1958) (holotype, LZ, destroyed). Data from *Linnaea* 9: 89. 1834. Tracing in b! Herb. Mett. of "*Oleandra micans* Kunze, *Peruvia Poeppig*."

Stem ascending to erect and climbing, with closely appressed scales. **Phyllopodia** 1–3(–6) mm long, stout, at first scaly. **Lamina** pubescent, especially on or near the costa, ca. 10–40 cm long, and (2–)3–3.5(–6) cm broad. **Indusia** slightly pubescent on the surface and with ciliate margins.

Epiphytic in forests, 325–1000 m, San Martín to Puno.

Trinidad and northern South America, south to Peru.

Oleandra pilosa and *O. lehmannii* are the only species in Peru with appressed scales on the stem. The variation in these species makes it impossible to determine the identity of the type of *Oleandra micans* from the original description and the tracing at B. No isotype has been seen. However, collections of *O. pilosa* in Peru are from 325–1000 m, while those of *O. lehmannii* are from 1480–2500 m. Since Tocache is at an altitude of about 500 m, *O. micans* is treated as a synonym of *O. pilosa*.

Huánuco: Tingo María (as San Martín), *Allard* 21215, 21999 (GH). Prov. Leoncio Prado, E of Tingo María, *J. Schunke* V. 5194 (GH, MO, US). **Pasco:** Prov. Oxapampa, Palcazú valley, *D. Smith* 3807 (GH). **Cuzco:** Río Mar-

capata, *de Lantreppe* (NY). Prov. Paucartambo, San Pedro, *Vargas* 6801 (UC, US). **Puno:** Tatanara, *Lechler* 2539 (B, K).

Comments

Oleandra hirta Brack., U.S. Expl. exped. 16 (fil.): 214. 1854. Atlas, t. 29. 1855. TYPE: Brazil, Organ Mountains, U.S. Expl. Exped. (US).

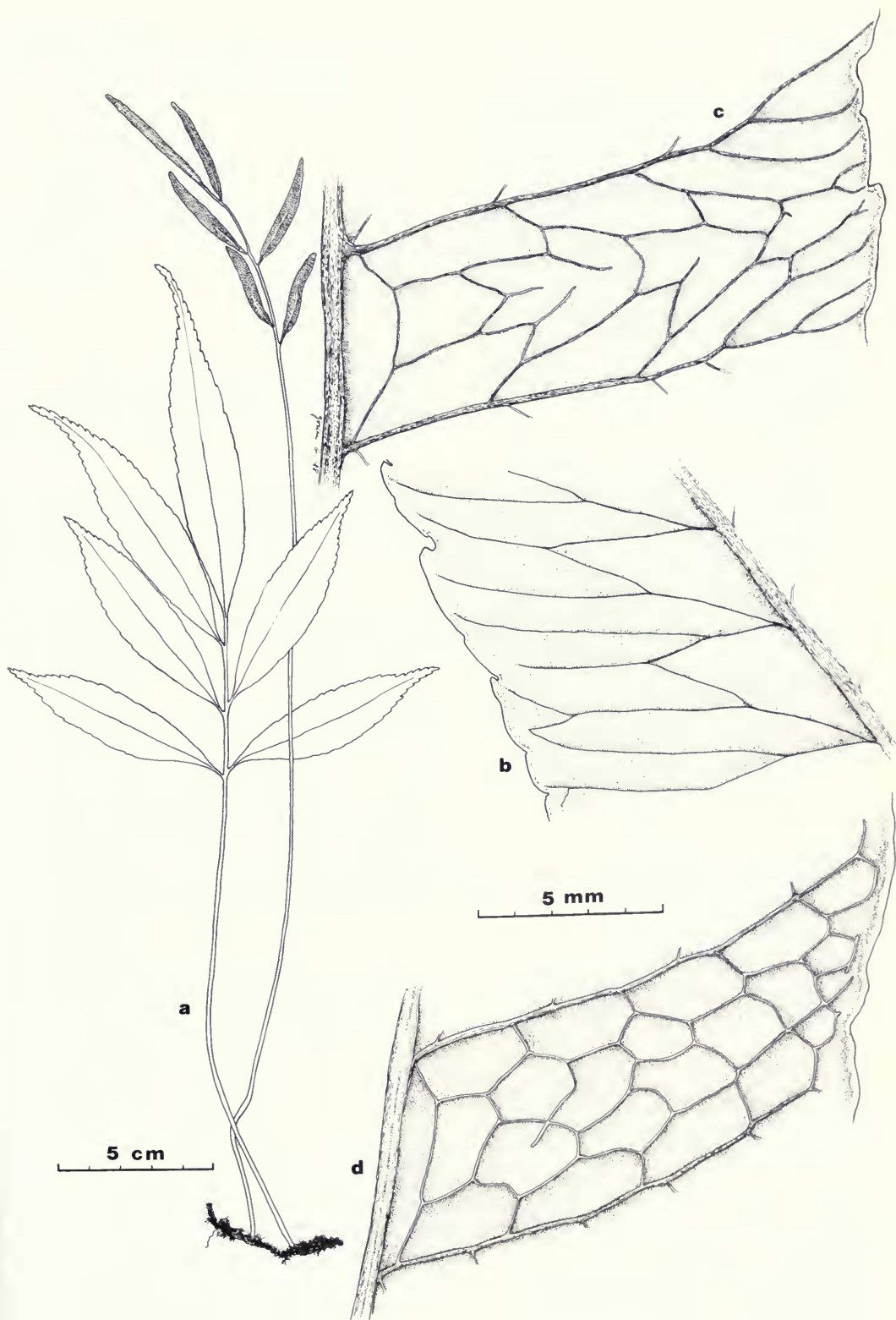
This species is found primarily in Brazil, but it has been collected in Bolivia (*Tate* 1152, NY) and may occur in southern Peru. The stem and scales are like those of *O. articulata* but the lamina is pubescent and the indusia are usually slightly pubescent on the surface or somewhat ciliate. The shape of the lamina is variable, as it is in *O. pilosa* and other species of the genus. It may be gradually attenuate basally and more or less acuminate apically (type of *O. hirta*), or it may vary to narrowly cuneate to broadly rounded basally and acute to caudate apically.

XXII. Bolbitis

Bolbitis Schott, Gen. fil. t. 13 (fasc. 3). 1835. TYPE: *Bolbitis serratifolia* (Kaulf.) Schott (*Acrostichum serratifolium* Kaulf.). **Figure 22.**

Plants terrestrial to epipetric, sometimes becoming hemiepiphytic. **Stem** short- to long-creeping, or scandent well up tree trunks, slender to rather stout, moderately to densely provided with light brown to blackish, subclathrate scales and with few to many fibrous roots. **Leaves** strongly to weakly dimorphic, ca. 25 cm to 2 m long, approximate to widely spaced, petiole continuous with the stem. **Lamina** simple and entire to 1-pinnate-pinnatifid, sometimes imparipinnate, the pinnae not articulate to the rachis, glabrate to somewhat scaly, the rachis or apical segment often bearing a proliferous bud. **Veins** areolate, with or without included free veinlets, or (in a few species not in Peru) free. **Sporangia** commonly borne over the abaxial surface of the segment, lacking pa-

FIG. 22. *Bolbitis serrata*: a, habit; b, portion of pinna, abaxial side. *Bolbitis serratifolia*: c, portion of pinna, abaxial side. *B. lindigii*: d, portion of pinna, abaxial side. (a, b from *Killip & Smith* 28495, US; c from *C. Schunke* 161, F; d from *Killip & Smith* 25184, F.)



raphyses. **Indusium** lacking. **Spores** monolete, more or less ellipsoidal.

Bolbitis is a pantropical genus of 44 species, including 14 in America. It is allied to *Lomagramma* and *Lomariopsis*, especially in the large, dimorphic leaves, which are borne on a stem that sometimes climbs well up the trunks of trees, and the acrostichoid pattern of sporangia. Venation is typically areolate, although veins of several Asian species are free. It differs from both allied genera in that the pinnae are not articulate to the rachis.

Key to Species of *Bolbitis*

- a. Sterile lamina pinnate and gradually reduced to a nonconform, usually pinnatifid, apex 1. **B. aliena**
- a. Sterile lamina simple, or pinnate and abruptly reduced to a discrete (usually conform) apical segment b
- b. Free veinlets abundant, spreading in various directions within the areoles c
- c. Sterile lamina lacking proliferous buds; adult sterile lamina commonly with an apical segment and 3–8 pinnae (very rarely simple or with 2 pinnae) 4. **B. nicotianifolia**
- c. Sterile lamina either with a subterminal or an axillary proliferous bud; adult sterile lamina simple, subternate or ternate d
- d. A proliferous bud borne in the pinna axils (or on a pinna stalk); sterile lamina ternate or subternate; pinnae often to 20 cm long and 12 cm broad 5. **B. oligarchica**
- d. A proliferous bud borne at or near the lamina apex; sterile leaf usually simple, occasionally subternate; pinnae (when present) to 8 cm long and 4 cm broad 7. **B. pandurifolia**
- b. Free veinlets lacking within the areoles or, when present, directed either distally (toward the pinna margin) or proximally (toward the costa), but not or rarely in various directions e
- e. Pinnae with only costal areoles (or rarely 1 or 2 more produced beyond the costal one); lateral pinnae commonly 4–6, less than 2 cm broad; rachis distinctly alate throughout 2. **B. serrata**
- e. Pinnae amply areolate beyond the costal areole; lateral pinnae of mature leaves 8–36, 2–5 cm broad; rachis nonalate, or scarcely alate toward the apex f
- f. Areoles mostly isomorphic and slightly elongated, free included veinlets lacking or rare; veins commonly distinct and abaxially raised; stem scales mostly 8–20 mm long and linear (sometimes caducous) 6. **B. lindigii**
- f. Areoles mostly heteromorphic and rather elongated, free included veinlets lacking to frequent and directed distally; secondary and tertiary veins becoming indistinct between primary ones, not or scarcely raised; stem scales 2–5 mm long, ovate to broadly lanceolate 3. **B. serratifolia**

1. ***Bolbitis aliena*** (Sw.) Alston, Bull. Misc. Inform. 1932: 310.

Acrostichum alienum Sw., J. Bot. (Schrader) 1800 (2): 13. 1802. TYPE: *Collector unknown*, Jamaica (holotype, s, Herb. Swartz; isotype, s, Herb. Swartz).

Gynnopteris aliena (Sw.) Presl, Tent. pterid. 244. 1836.
Leptochilus alienus (Sw.) C. Chr., Bot. Tidsskr. 26: 285. 1904.

Species in Peru can be further distinguished from *Lomariopsis* by their anastomosing veins. This treatment is adapted in large part from the monograph of Hennipman (1977).

Reference

HENNIPMAN, E. 1977. A monograph of the fern genus *Bolbitis* (Lomariopsidaceae). Leiden Bot., ser., 2: 1–331.

Plants terrestrial or epipetric. **Stem** long-creeping. **Sterile leaves** well spaced, pinnate or deeply pinnatisect, 25–90 cm long, 14–30 cm broad. **Lamina** broadest at or near the base, reduced gradually to a deltate, pinnatifid apex. **Rachis** broadly alate throughout, or nonalate toward base, lacking proliferous buds. **Pinnae** commonly 3–6 pairs, adnate, or proximal ones stalked, entire to shallowly lobed, or basal pair with a greatly expanded basal

lobe. **Veins** copiously areolate, lacking included free veinlets. **Fertile leaves** commonly smaller than the sterile, with pinnae less deeply lobed.

In rain forests and wooded ravines, creeping on earth or rocks or rocky cliffs, 100–1000 m, Amazonas to Pasco and Ucayali.

Southern Mexico; Honduras; Nicaragua; West Indies; Venezuela and Colombia, southward to Bolivia.

This should not be confused with other species in Peru, as it is the only one lacking a discrete apical segment. It is sometimes confused with *B. portoricensis* (Sprengel) HENNIPMAN, a similar species with a pinnatifid apex whose range extends to Ecuador. However, the areoles of *B. portoricensis* have included free veinlets, whereas these are lacking in *B. aliena*.

Amazonas: Prov. Bagua, Río Marañón opposite Quebrada Miraná, *Wurdack 2033* (GH, US). **San Martín:** Prov. Mariscal Cáceres, Dist. Tocache Nuevo, *Schunke V. 3891* (F, GH, MO, US). **Huánuco:** Prov. Huánuco, Tingo María, *Tryon & Tryon 5281* (F, GH, UC, US). **Pasco:** Prov. Oxapampa, Palcazú, Río Alto Iscozacín, *Foster & d'Achille 10129* (F). **Ucayali:** Km 86 on Pucallpa–Tingo María road, along trail to Arboretum of Bosque von Humboldt Experimental Station, *D. Smith 1225* (MO).

2. *Bolbitis serrata* (Kuhn) C. Chr., Index fil. suppl. 3: 50. 1934. **Figure 22a–b.**

Chrysodium serratum Kuhn, Linnaea 36: 63. 1869. TYPE: Peru, San Martín, near Tarapoto, *Spruce 4123* (holotype, B; isotypes, BM!, GH!, K!, NY, P, US!; photos, F & GH of US).

Acrostichum serratum (Kuhn) Baker, Syn. fil., ed. 2: 524. 1874, *nom. illeg.* (not Poirét, 1810).

Leptochilus serratus (Kuhn) C. Chr., Bot. Tidsskr. 26: 289. 1904.

Plants terrestrial or epipetric. **Stem** long-creeping, slender, to 5 mm thick. **Sterile leaves** lacking a proliferous bud, subdistant, pinnate, to 40 cm long and 10 cm broad. **Lamina** with 4–6(–8) pinnae and a conform apical segment, this narrow-lanceolate or narrow-elliptic and with a narrowly cuneate base. **Rachis** distinctly alate throughout, the wing with a cartilaginous margin. **Pinnae** 0.8–2(–2.3) cm broad, short-stalked, the margin entire to crenate-serrate, the base narrow-cuneate. **Veins** areolate only along the costa, or rarely with 1 or 2 more areoles beyond the costal one, the areoles lacking included free veinlets. **Fertile leaves** commonly longer than the sterile, the lamina smaller, but the petiole much longer.

In rain forests, creeping among wet rocks or on soil, 100–550 m, San Martín and Loreto.

Colombia; Ecuador; Peru.

The smaller leaves of *B. serrata*, with fewer pinnae and more slender stems, usually distinguish it from *B. lindigii* and *B. serratifolia*, but the venation pattern is a more diagnostic character. In most pinnae there is merely a costal areole, but sometimes one or two areoles may be produced beyond this. None of the areoles bear included free veinlets. The veins of *B. lindigii* regularly anastomose, are commonly distinct and raised abaxially, and the areoles beyond the costal one are nearly isomorphic (pentagonal or hexagonal, not greatly elongated), they lack included free veinlets, or the rare ones are minute and often directed toward the costa. Veins of *B. serratifolia* rather freely anastomose, but are not or scarcely raised, and secondary and tertiary veins become indistinct between the primary ones. The areoles are quite irregular in shape and many are greatly elongated. Free included veinlets may be frequent to sparse or lacking, but when present they are directed toward the pinna margin.

San Martín: Tarapoto, near road to Yurimaguas, *Martin & Plowman 1815* (GH, US). **Loreto:** Balsapuerto, lower Río Huallaga basin, *Killip & Smith 28495* (F, GH, NY, US). Prov. Alto Amazonas, above Pongo de Manseriche, *Wurdack 2110* (F, GH, NY, S, U, UC, US).

3. *Bolbitis serratifolia* (Kaulf.) Schott, Gen. fil. t. 13. 1835. **Figure 22c.**

Acrostichum serratifolia Kaulf., Enum. fil. 66. 1824. TYPE: Brazil, Rio de Janeiro (B?, LE?).

Poecilopteris crenata Presl, Epim. bot. 174. 1851. TYPE: Brazil, near Rio de Janeiro, *Mikan* (holotype, PR or PRC).

Leptochilus serratifolius (Kaulf.) C. Chr., Bot. Tidsskr. 26: 289. 1904.

Leptochilus crenatus (Presl) C. Chr., Index fil., suppl. 1: 48. 1913.

Bolbitis crenata (Presl) C. Chr., Index fil., suppl. 3: 47. 1934.

Plants terrestrial, epipetric, or hemiepiphytic. **Stem** short- to long-creeping, sometimes low-scandent, to 1.5 cm thick, sparsely provided with ovate or lanceolate scales 2–5 mm long. **Sterile leaves** occasionally with a proliferous bud (or primordium) subapically on the apical segment (or pinnae), approximate on the stem, pinnate, to 1.2 m long and 30 cm broad, the rachis, costae and veins sparsely provided abaxially with castaneous, filamentous scales. **Lamina** with 8–36 pinnae and a

conform or subconform apical segment, this broadly lanceolate and with a broadly cuneate or rounded base. **Rachis** not alate, or only scarcely so near the apex. **Pinnæ** 2–4 cm broad, short-stalked, the margin entire to crenate-serrate. **Primary veins** distinct, but secondary and tertiary ones usually indistinct between the primary ones, not or scarcely raised, amply anastomosing, with a broad costal areole and many heteromorphic and often elongated areoles beyond, free included veinlets lacking, or few to many and then directed distally (toward pinna margin). **Fertile leaves** subequal to the sterile but the petiole proportionately longer and the pinnæ much shorter and narrower.

In dense forests or wooded ravines, on moist ground, often low-scandent on bases of tree trunks, occasionally on rocks, 150–1600 m, San Martín and Loreto south to Ayacucho and Cuzco.

Southern Mexico (Chiapas); Costa Rica; Panama; Surinam to Colombia, southward to Brazil and Argentina.

This species bears a superficial resemblance to *B. lindigii*. See treatments of the latter and *B. ser-rata* for detailed comparison.

San Martín: Near Tarapoto, *Spruce* 4736 (BR, G, GH, K, P). **Loreto:** Puerto Arturo, below Yurimaguas, *Killip & Smith* 27797 (F, US). **Huánuco:** Prov. Huánuco, Tingo María, *Tryon & Tryon* 5234 (F, GH, US). **Junín:** Schunke Hacienda above San Ramón, *C. Schunke A-215* (GH, US). **Ayacucho:** Estrella, between Huanta and Río Apurímac, *Killip & Smith* 22626 (F, US). **Cuzco:** Prov. La Convención, Cordillera Vilcabamba, Río Klause, *Dudley* 10187 (GH).

4. *Bolbitis nicotianifolia* (Sw.) Alston, Bull. Misc. Inform. 1932: 310.

Acrostichum nicotianifolium Sw., Syn. fil. 13. 199. 1806. TYPE: Virgin Islands, St. Thomas, *Vententat* (holotype, s).

Gymnopteris nicotianifolia (Sw.) Presl, Tent. pterid. 244. 1836.

Leptochilus nicotianifolius (Sw.) C. Chr., Bot. Tidsskr. 26: 285. 1904.

Leptochilus killipii Maxon, Amer. Fern J. 21: 138. 1931. TYPE: Panama, above Juan Díaz, *Killip* 2778 (holotype, us!; isotypes, B, P, s).

Bolbitis killipii (Maxon) Lell., Fern Gaz. 11: 107. 1975.

Plants terrestrial or hemiepiphytic. **Stem** short-to long-creeping or scandent, moderately provided with lanceolate, brown to blackish scales 3–5 mm long. **Sterile leaves** lacking a proliferous bud, approximate to subdistant on the stem, to 1.2 m long

and 40 cm broad. **Lamina** pinnate (rarely simple or subternate), with 3–8 pinnæ and a conform or somewhat enlarged apical segment, this elliptic and with a cuneate or shortly decurrent base. **Rachis** nonalate. **Pinnæ** commonly to 28 cm long and 8 cm broad, subsessile or short-stalked, the margin essentially entire, the base cuneate or often obtuse basiscopically. **Veins** copiously areolate, with many free included veinlets spreading in various directions. **Fertile leaves** pinnate (rarely simple), similar to sterile ones, but with fewer and smaller pinnæ.

In rain forests or in wooded ravines, on wet ground or on bases of tree trunks, 100–540 m, San Martín, Loreto, Huánuco, Cuzco, Madre de Dios, and Puno.

Guatemala to Panama; West Indies; the Guianas to Colombia and south to Peru.

The rare specimens with simple leaves or only with two pinnæ might be confused with *B. oligarchica* or *B. pandurifolia*. See treatments of these two species for further discussion.

Bolbitis nicotianifolia and *B. oligarchica* are very closely related and may hybridize, as suggested by Hennipman (1977). There is a specimen from Tarapoto, San Martín, *Ll. Williams* 6064 (US), containing a portion of a sterile leaf which seems to be intermediate between the two species. Although there are nine pinnæ (typical of *B. nicotianifolia*), these are more strongly produced basiscopically and only 1½ times as long as broad (characteristic of *B. oligarchica*). Furthermore, there is a proliferous bud in the axil of a subapical pinna, a condition common in the latter species, but not in the former. Both species have been found in San Martín.

San Martín: “In monte Guayrapurima,” *Spruce* 4636 (K). **Loreto:** Salinas, Río Mazán, *Schunke* 372 (F, GH, UC, US). **Huánuco:** Prov. Pachitea, Comunidad Nativa Santa Marta, *D. Smith* 1244 (MO). **Cuzco:** Prov. Paucartambo, Hacienda Villa Carmen, *Vargas* 14680 (GH). **Madre de Dios:** Río Manú, Cocha Cashu Station, *Foster & Terborgh* 6622 (F). **Puno:** Prov. Carabaya, Hacienda Palmera, *Vargas* 16131 (GH).

5. *Bolbitis oligarchica* (Baker) Hennipman, Amer. Fern J. 65: 30. 1975.

Acrostichum oligarchicum Baker, Syn. fil. 418. 1868. LECTOTYPE (designated by Maxon, Amer. Fern J. 21: 139. 1931): Peru, San Martín, Mt. Guayrapurima, near Tarapoto, *Spruce* 4737 (K; photo, us).

Leptochilus oligarchicus (Baker) C. Chr., Bot. Tidsskr. 26: 285. 1904.

Hypoderris stuebelii Hieron., Hedwigia 46: 323. 1907. TYPE: Ecuador, Tungurahua, *Stübel* 906 (B).

Leptochilus bradeorum Rosenst., Repert. Spec. Nov. Regni Veg. 9: 70. 1910. TYPE: Costa Rica, La Palma, *Brade & Brade* (holotype, B?; isotypes, NY, UC!).

Leptochilus stuebelii (Hieron.) Maxon, Proc. Biol. Soc. Wash. 46: 142. 1933.

Bolbitis bradeorum (Rosenst.) C. Chr., Index fil. suppl. 3: 47. 1934.

Bolbitis stuebelii (Hieron.) C. Chr., Index fil. suppl. 3: 50. 1934.

Plants terrestrial. **Stem** stout, short-creeping, moderately provided with lanceolate scales 3–5 mm long. **Sterile leaves** approximate, often crowded, ternate, 30–90 cm long. **Lamina** with a pair of subopposite pinnae and a greatly enlarged apical segment, this broadly elliptic to rhomboid, often to 40 cm long and 30 cm broad, the base cuneate to short-decurrent. **Rachis** bearing at the axils (or on stalks) of pinnae a proliferous bud. **Pinnae** often to 20 cm long and 12 cm broad, subsessile or short-stalked, essentially entire, the base cuneate and usually more strongly produced basiscopically. **Veins** copiously areolate, with many included free veinlets spreading in various directions. **Fertile leaves** always ternate, much smaller than the sterile, but with longer petioles, the pinnae with longer stalks and more widely spaced from the apical segment.

In rainforests, on wet, often rocky, ground, 400–1700 m, Amazonas to Junín and Ucayali.

Costa Rica; Colombia to Bolivia.

Three of the species of *Bolbitis* occurring in Peru have free veinlets included within the areoles and spreading in various directions: *B. nicotianifolia*, *B. oligarchica*, and *B. pandurifolia*. The other species in Peru either lack free veinlets or have them directed always toward the pinna margin, or always toward the costa. It is interesting that the leaves of these three species tend to consist of a large terminal segment subtended by a pair of somewhat to greatly reduced pinnae. This condition is found but rarely in *B. nicotianifolia*, occasionally in *B. pandurifolia*, and always in *B. oligarchica*.

Amazonas: Prov. Bagua, valley of Río Marañón above Cascadas de Mayasi, *Wurdack* 1896 (F, GH, UC, US). **San Martín:** Valley of Río Huallaga, road between Tocache Nuevo and Juanjui, *Croat* 58073 (MO). **Huánuco:** Prov. Leoncio Prado, Dist. Rupa Rupa, near Cerro Quemado, *Schunke* V. 10161 (F, MO, US). **Pasco** (as Junín): Pichis

Trail, Santa Rosa, *Killip & Smith* 26174 (GH, US). **Junín:** “Prov. Satipa-Pichanaki” (Dist. Pichanaqui in Prov. Chanchamayo?), Rodal del Proyecto Peruano-Alemán, *León* 224 (USM). **Ucayali** (as Loreto): Prov. Coronel Portillo, Dist. Padre Abad, Boquerón de Padre Abad, *Schunke* V. 3073 (F, GH, US).

6. *Bolbitis lindigii* (Mett.) C. Chr., Index fil. suppl. 3: 48. 1934. **Figure 22d.**

Chrysodium lindigii Mett., Ann. Sci. Nat. Bot., ser. 5, 2: 205. 1864. TYPE: Colombia, Boyacá, Muzo, *Lindig* 258 (holotype, B; isotypes, BM, K, P).

Acrostichum lindigii (Mett.) Baker, Syn. fil. 423. 1868, nom. illeg. (not Karsten, 1858).

Leptochilus lindigii (Mett.) C. Chr., Bot. Tidsskr. 26: 290. 1904.

Plants hemiepiphytic. **Stem** long-creeping, scandent high on tree trunks, to 2 cm thick, abundantly provided with linear scales 8–20 mm long (these sometimes caducous). **Sterile leaves** lacking a proliferous bud, commonly widely spaced, pinnate, to 1 m long and 30 cm broad. **Lamina** with 16–36 pinnae and a conform or subconform apical segment, this broadly lanceolate and with a cuneate base. **Rachis** not alate, or only scarcely so near the apex. **Pinnae** 2–5 cm broad, short-stalked, the margin crenate-serrate to crenately lobed. **Veins** commonly distinct and raised abaxially, regularly anastomosing, with a broad costal areole and many nearly isomorphic areoles beyond, free included veinlets lacking or very rare and then usually directed proximally (toward the costa). **Fertile leaves** shorter than the sterile and the pinnae much shorter and narrower.

Hemiepiphytic, scandent to 23 m on tree trunks, in deep rain forests, 100–1200 m, San Martín and Loreto to Cuzco and Madre de Dios.

Costa Rica southward to Bolivia; Brazil.

This species, with its large leaves, numerous pinnae, and a conform apical segment is sometimes confused with *B. serratifolia*. However, the latter is only low-scandent (if at all), whereas stems of *B. lindigii* often climb on tree trunks, sometimes to a height of 23 m. The two also are easily separated by the venation pattern, which is discussed in detail under *B. serrata*.

San Martín: Prov. Mariscal Cáceres, Dist. Tocache Nuevo, Puerto Pizana, *Schunke* V. 6897 (MO, UC). **Loreto:** Gamitanacocha, Río Mazán, *J. Schunke* 333 (F, GH, NY, S, US, USM). **Huánuco:** Prov. Pachitea, Dist. Puerto Inca, Bosque Nacional de Iparia, *Schunke* V. 2846 (F). **Pasco:** Oxapampa, Palcazú Valley, Iscozacín, *Foster et*

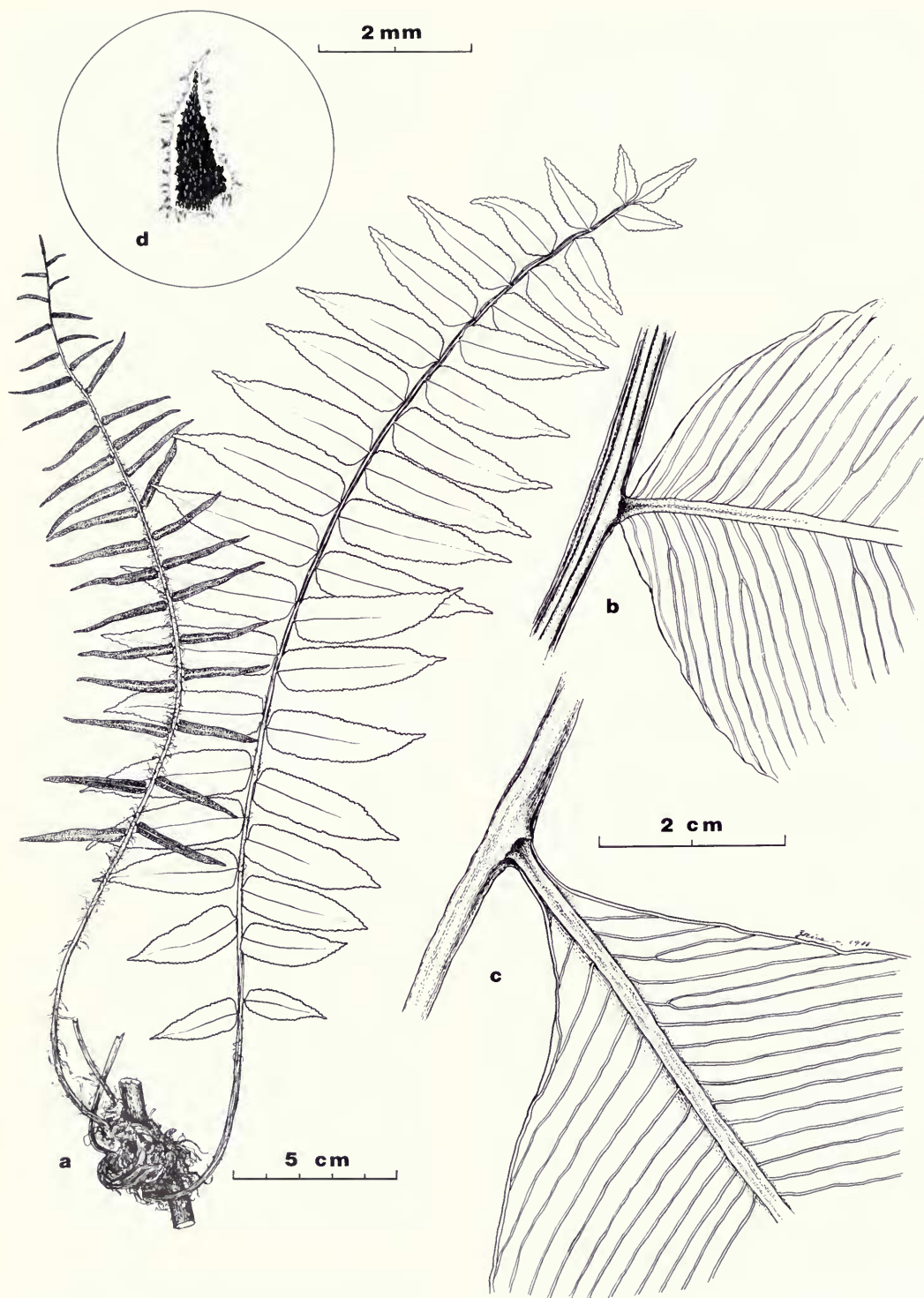


FIG. 23. *Lomariopsis fendleri*: a, habit. *Lomariopsis japurensis*: b, portion of rachis and pinna base, adaxial side. *Lomariopsis nigropaleata*: c, portion of rachis and pinna base, abaxial side; d, scale from petiole base. (a from Killip & Smith 27792, F; b from L. Williams 5262, F; c, d from Schunke V. 2843, F.)

al. 7886 (F, MO). **Junin:** Chanchamayo Valley, C. Schunke 846, 854 (F). **Cuzco:** Prov. La Convención, near Río Mapi tunuari and Hacienda Luisiana, Dudley 11511, 11515 (GH). **Madre de Dios:** Tambopata, Albergue "Cuzco Amazonico," León 827 (F, MO).

7. **Bolbitis pandurifolia** (Hooker) C. Chr. Index fil. suppl. 3: 49. 1934.

Gymnopteris pandurifolia Hooker, Sec. cent. ferns t. 87. 1861. TYPE: Peru, San Martín, Mt. Guayrapurima near Tarapoto, Spruce 4741 (holotype, K; isotypes, BM, BR, P; photos, F & US of BM). *Acrostichum pandurifolium* (Hooker) Hooker, Sp. fil. 5: 271. 1864. *Leptochilus pandurifolius* (Hooker) C. Chr., Bot. Tidsskr. 26: 286. 1904.

Plants terrestrial or low-scandent. **Stem** stout, short-creeping, moderately provided with lanceolate, attenuate scales 2–4 cm long. **Sterile leaves** approximate and often crowded, simple or subternate, to 60 cm long and 20 cm broad, essentially glabrous, bearing a proliferous bud at or near the apex. **Lamina** simple, broadly oblong-lanceolate, or often with a pair of greatly reduced, subopposite pinnae, in simple leaves the base truncate to cordate, and in ternate leaves the large apical segment usually cuneate at base. **Pinnae** (when present) to about 8 cm long and 4 cm broad, subsessile or short-stalked, elliptic, essentially entire, the base cuneate. **Veins** copiously areolate, with included free veinlets spreading in various directions. **Fertile leaves** about as long as the sterile, but petiole proportionately much longer and lamina shorter.

In dense rain forests, on wet ground or occasionally scandent on bases of tree trunks, 450–1100 m, Amazonas, San Martín, and Pasco.

Ecuador and Peru.
The lamina of this species is frequently simple, or sometimes it consists of a large apical segment subtended by a pair of much-reduced pinnae. Rarely, leaves of *B. nicotianifolia* may be simple and then the base of the lamina is cuneate to decurrent. In contrast, the simple lamina of *B. pandurifolia* is truncate to subcordate at the base.

Amazonas: Prov. Bagua, valley of Río Marañón above Cascadas de Mayasi, Wurdack 1897 (GH, NY, US). **Pasco:**

(as Junin): Pichis trail, San Nicolás, Killip & Smith 26039 (NY, US).

XXIII. **Lomariopsis**

Lomariopsis Fée, Mém. Foug. 2: 10. 1845. TYPE: *Lomariopsis sorbifolia* (L.) Fée (*Acrostichum sorbifolium* L.). **Figure 23.**

Plants terrestrial (occasionally epipetric), usually becoming scandent-epiphytic. **Stem** long-creeping or scandent, to ca. 15 m long, slender to stout, bearing scales and few to many fibrous roots. **Leaves** moderately to strongly dimorphic (fertile pinnae narrower than the sterile), ca. 0.2–1.5 m long, closely to (usually) widely spaced on the stem. **Lamina** 1-pinnate, imparipinnate, glabrate to slightly and minutely scaly, the pinnae entire to crenate-serrate (or on juvenile leaves deeply sinuate or dentate), articulate to the rachis, the apical segment continuous (or in three West Indian species articulate). **Veins** free, simple or forked. **Sporangia** borne over the abaxial surface of the pinnae. **Indusia** and paraphyses lacking. **Spores** monolete, ellipsoidal.

The genus *Lomariopsis* is essentially pantropical, containing about 45 species, with perhaps 15 in the Neotropics. It is characterized by the dorsiventral and usually scandent stem, the 1-pinnate, dimorphic lamina, and the articulate, free-veined pinnae with acrostichoid sori. Its closest allies in Peru, with which it might be confused, are *Lomagramma* and *Bolbitis*.

References

HOLTUM, R. E. 1932. On *Stenochlaena*, *Lomariopsis* and *Teratophyllum* in the Malayan region. Gard. Bull. Straits Settlements, 5: 245–313.
HOLTUM, R. E. 1940. New species of *Lomariopsis*. Bull. Misc. Inform., 1939: 613–628.
UNDERWOOD, L. M. 1907. American ferns, 7: The American species of *Stenochlaena*, Bull. Torrey Bot. Club, 38: 591–603.

Key to Species of *Lomariopsis*

- a. Sterile pinnae of adult leaves 20–30 pairs, larger ones 1–1.8 cm broad; fertile pinnae 1.5–4 mm broad; rachis broadly or narrowly alate throughout, at least in the distal half 1. **L. fendleri**

- a. Sterile pinnae of adult leaves 2–12 pairs (or leaves rarely simple in #2 & #3), larger ones 3–9 cm broad; fertile pinnae 7–20 mm broad; rachis narrowly alate only near the apex b
- b. Scales of stem and petiole base moderate to abundant, 3–12 mm long, linear to lanceolate, essentially concolorous, tawny to brownish black c
- c. Larger sterile pinnae 3–5 cm broad, sessile or short-stalked (0–2 mm), apex acuminate, base commonly obtuse to broadly cuneate; larger fertile pinnae 8–16 mm broad, sessile or subsessile 2. *L. japurensis*
- c. Larger sterile pinnae 6–9 cm broad, on stalks (3–)4–15 mm long, apex acute to subacute, base narrow-cuneate; larger fertile pinnae 16–20 mm broad, the stalks 3–5 mm long 3. *L. latipinna*
- b. Scales of stem and petiole base sparse and scattered, 1–2(–3) mm long, ovate or broadly lanceolate, mostly bicolorous, lustrous black with a ferruginous border 4. *L. nigropaleata*

1. *Lomariopsis fendleri* D. C. Eaton, Mem. Amer. Acad. Arts, n.s. 8: 195. 1860. TYPE: Venezuela (“prope Coloniam Tovar”), *Fendler 335* (holotype, YU; isotypes, GH!, K!). **Figure 23a.**

Lomariopsis vestita Fourn., Bull. Soc. Bot. France 19: 250. 1872. TYPE: Nicaragua, Chontales, *Lévy 476* (holotype, P; isotype, K!).

Stenochlaena fendleri (D. C. Eaton) Underw., Bull. Torrey Bot. Club 33: 595. 1907.

Stenochlaena vestita (Fourn.) Underw., Bull. Torrey Bot. Club 33: 600. 1907.

Stem stout, provided with stramineous to tawny, lanceolate, attenuate scales, these to ca. 1 cm long and with ciliate margins. **Sterile leaves** to 65 cm long and 20 cm broad, petiole 1–10(–12) cm long, with scales like those of the stem. **Lamina** strongly to moderately reduced at the base, those of adult leaves with (18–)20–30 pairs of alternate pinnae. **Rachis** broadly to narrowly alate throughout, or at least in the distal half. **Pinnae** of adult lamina 1–1.8 cm broad, sessile, broadest at or near the base, margins entire to crenulate or serrulate (in juvenile leaves often deeply sinuate to dentate), subcordate, truncate, obtuse or (very rarely) broadly cuneate at base, apices acuminate to long-tapering. **Fertile leaves** usually shorter than sterile ones, but with proportionately longer petioles. **Pinnae** 1.5–4 mm broad, sessile or subsessile.

In dense forests, scandent on tree trunks, 130–1300 m, San Martín, Loreto, Junín, Cuzco, and Madre de Dios.

Southern Mexico to Panama; Venezuela; Colombia to Bolivia.

This is very similar to the West Indian *L. sorbifolia* (L.) Fée, which differs in its short-stalked, fertile pinnae and its fewer (15–20 pairs) sterile pinnae; the pinnae of the latter are commonly

broadest near the center and have a cuneate base. Pinnae of *L. fendleri* are broadest at or near the obtuse or truncate base. However, pinna bases in *L. fendleri* are occasionally broadly cuneate, so this character should be used in combination with other features.

Stenochlaena angusta Underw., from Colombia, is probably to be included within *L. fendleri*. Two of the isotypes examined, *H. H. Smith 1051*, Colombia (F, US), are virtually indistinguishable from *L. fendleri*, except that the sterile pinnae are broadly cuneate at base. A paratype from Peru cited by Underwood (*Spruce 1556*) is simply a sterile juvenile plant of *L. fendleri*, with the pinna bases broadly cuneate rather than truncate.

In the *L. sorbifolia* complex, juvenile leaves often are quite different from adult ones. Conspicuous wings, each up to 1.5 mm broad, are usually borne on the petiole as well as on the rachis, pinna margins may be broadly and deeply dentate to sinuate, and pinna bases often may be broadly cuneate. For these reasons, many South American collections containing only juvenile leaves have been erroneously identified as *L. sorbifolia*.

San Martín: Prov. Mariscal Cáceres, Dist. Tocache Nuevo, *J. Schunke V. 3569* (F, US), 7609 (F, MO, UC). Tingo Maria, *Allard 20889* (GH, US). **Loreto:** Lower Río Huallaga, *Ll. Williams 5080* (F, US), 5082 (F). **Junín:** East of Quimiri Bridge, near La Merced, *Killip & Smith 23908* (F). **Cuzco:** Prov. La Convención, along Río Mapitunuari, *Dudley 10189* (GH). **Madre de Dios:** Prov. Manú, Parque Nacional de Manú, Río Manú, *Foster et al. 6847* (F).

2. *Lomariopsis japurensis* (Mart.) John Sm., Hist. fil. 140. 1875. **Figure 23b.**

Acrostichum japurensis Mart., Icon. pl. crypt. 86, t. 24, 1834. TYPE: Colombia (as Brazil), Río Ja-

purá, *Martius* (holotype, M?; isotype, L; photos, GH & US).

Acrostichum phlebodes Kunze, *Linnaea* 9: 33. 1835.

TYPE: Peru, Maynas, *Poeppig*, *Diary*. 2326 (holotype, LZ, destroyed; isotype, B?).

Stenochlaena japurensis (Mart.) Griseb., *Fl. Brit. W. Ind.* 676. 1864.

Stem stout, moderately to abundantly provided with essentially concolorous, ferruginous to brownish black scales, these appressed to spreading, 3–5(–6) mm long, linear to narrow-lanceolate, their margins subentire to ciliate. **Sterile leaves** to 1 m long and 30 cm broad, the petiole 10–30 cm long, with scales like those of the stem, but larger (to 10 mm long). **Lamina** pinnate (or in juvenile leaves often simple), strongly to moderately reduced at base, with (0)1–12 pairs of alternate pinnae. **Rachis** narrowly (if at all) alate only toward the apex. **Pinnae** (larger ones of adult laminae) 3–5 cm broad, sessile or with stalks less than 2 mm, lanceolate or elliptic-lanceolate, margins entire, commonly obtuse or broadly cuneate at base, the apices acuminate. **Fertile leaves** usually shorter than sterile ones. **Pinnae** 8–16 mm broad, sessile or subsessile.

In lowland rain forests and wooded ravines, scandent (to 12 m) on tree trunks, 100–700 m, San Martín and Loreto to Ayacucho and Madre de Dios.

Guatemala to Panama; Trinidad to Colombia, south to Brazil and Bolivia.

This species has been confused with *L. erythroides* (Kunze) Fée of Brazil, which is similar in many laminar characteristics, but which has lighter colored stem and petiole scales and narrower fertile pinnae, these less than 7 mm broad. *Lomariopsis nigropaleata* is even more closely related, and may be merely a geographic variant of *L. japurensis*. See treatment of the latter for further discussion. One specimen of *L. japurensis* from Loreto (*Gentry et al.* 29748, MO) has more narrowly cuneate pinnae (as in *L. nigropaleata*), and many of the stem scales lighter in color (like *L. erythroides*). This is a prime example of the variability of characters in this species complex.

San Martín: Prov. Mariscal Cáceres, Tocache Nuevo, Quebrada de Cachiyacu, *J. Schunke* V. 8518 (F, UC). **Loreto:** Gamitanacocha, Río Mazán, *J. Schunke* 306 (F, GH, UC, US, USM). **Huánuco:** Pachitea, Codo de Pozuzo, *Foster* 9376 (F, MO). **Ayacucho:** Río Apurímac Valley, near Kimpitiriki, *Killip & Smith* 22871 (US). **Cuzco:** Prov. La Convención, near Hacienda Luisiana, *Dudley* 11571 (GH). **Madre de Dios:** Prov. Manú, Cerro de Pantiacolla, *Foster et al.* 10756 (F).

3. *Lomariopsis latipinna* Stolze, *sp. nov.*

Folia dimorpha; folium sterile pinnatum, raro simplex, usque ad 60 cm longum et 50 cm latum; rhachis prope apicem anguste alatae; paleae petiolae 6–12 mm longae, fulvae vel aurantiaceae, non nitidae, margine ciliolato; pinnae steriles (0)1–4 jugae, maiores 6–9 cm latae, ellipticae vel elliptico-lanceolatae, ad basin anguste cuneatae, apicibus acutis vel subacutis, marginibus integris, petiolulis (3)4–15 mm longis; pinnae fertiles maiores 16–20 mm latae, petiolulis 3–5 mm longis.

Stem stout, moderately to abundantly provided with concolorous, tawny to dull orange scales, these appressed to spreading, 6–8 mm long, lanceolate, their margins ciliate. **Sterile leaves** to 60 cm long and 50 cm broad, the petiole 7–20 cm long, with scales like those of the stem but longer (8–12 mm) and broader. **Lamina** pinnate (or rarely simple), not or scarcely reduced at base, with (0)1–4 pairs of alternate pinnae. **Rachis** narrowly alate (if at all) only toward the apex. **Pinnae** (larger ones of adult laminae) 6–9 cm broad, on stalks (3–)4–15 mm long, elliptic or elliptic-lanceolate, margins entire, narrow-cuneate at base, the apices acute or subacute. **Fertile leaves** shorter than sterile ones. **Pinnae** 16–20 mm broad, their stalks 3–5 mm long.

TYPE—Peru, Junín, Prov. Chanchamayo, “Pichanaki” (Dist. Pichanaqui), *van der Werff et al.* 8626 (holotype, UCL; photo, F).

In lowland rain forests, scandent on tree trunks, 300–700 m, Lambayeque, Pasco, Junín, and Madre de Dios.

Apparently endemic.

This species and *L. nigropaleata* both have broad, stalked, cuneate pinnae, but those of the latter species are abruptly narrowed to a sharply pointed apex. Pinnae of *L. latipinna* are even broader (to 9 cm) and gradually taper to an acute or subacute apex. Stem and petiole scales of the two species also differ markedly: those of *L. nigropaleata* are scattered, tiny and bicolorous, whereas those of *L. latipinna* (especially at the petiole base) are abundant, larger, and concolorous.

The lamina of juvenile leaves is occasionally simple in both *L. japurensis* and *L. latipinna*. Insufficient juvenile material has been seen to be able to establish diagnostic characters, but it appears that the simple lamina of *L. japurensis* is rarely more than 5 cm broad, while in *L. latipinna* the simple lamina is 8–10 cm broad.

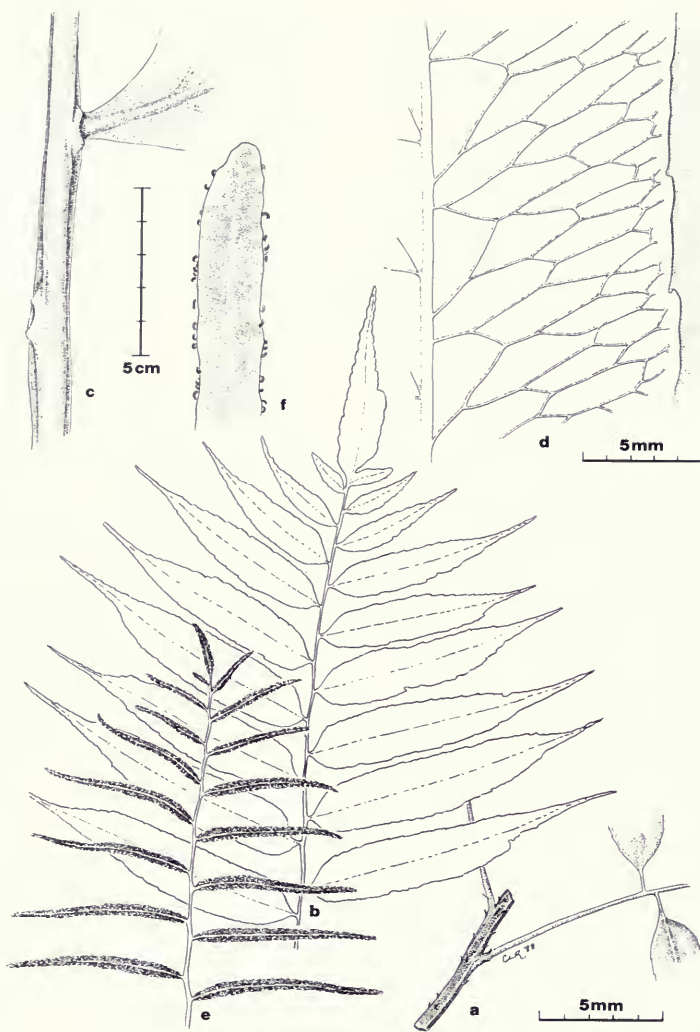


FIG. 24. *Lomagramma guianensis*: a, portion of stem and petiole, adaxial side; b, portion of sterile leaf; c, rachis of sterile leaf; d, portion of pinna, abaxial side; e, portion of fertile leaf; f, apex of fertile pinna, adaxial side. (a from Soukup & Lopez 4615, GH; b, d, e, f from Schunke V. 2846, F; c from Schmalz 40, Brazil, F.)

Lambayeque: Puerto Nazareth, 5 km from Olmos, *El-lenberg 3452* (GH). **Amazonas:** Bagua, forest behind Parcelación Monterrico, *Knapp & Alcorn 7592* (MO). **Pasco:** Prov. Oxapampa, Puerto Laguna, *D. Smith 8412* (MO?, UC). **Madre de Dios:** Prov. Manú, Parque Nacional del Manú, Cocha Cashu Biological Station, *M. Foster P-84-112, P-84-119* (UC).

4. *Lomariopsis nigropaleata* Holttum, Bull. Misc. Inform. 1939; 618. 1940. TYPE: Peru, Loreto, Florida, Río Putumayo, *Klug 2082* (holotype, US!; isotypes, BM, F!, GH!, K, NY). Figures 23c-d.

Stem stout, sparsely provided with mostly bicolorous scales, these lustrous black with a ferruginous, entire or sparsely ciliolate margin, 1–2 mm long, ovate or broadly lanceolate. **Sterile leaves** to 1 m long and 30 cm broad, the petiole to 25 cm long, with scattered, appressed scales like those of the stem. **Lamina** pinnate, somewhat reduced at base, with 4–10 pairs of pinnae. **Rachis** narrowly alate only toward the apex. **Pinnae** (larger ones of adult laminae) 3.5–5.5 cm broad, at least proximal ones on stalks (2–)3–6 mm long, elliptic to oblong-lanceolate, the margins entire to obscurely crenate

or sinuate, cuneate at base, the apices abruptly narrowed to a mucronate or caudate tip. **Fertile leaves** usually shorter than the sterile ones. **Pinnae** 7–16 mm broad, on stalks 2–5 mm long.

In lowland rain forests and wooded ravines, scandent to 6 m on tree trunks, 100–750 m, San Martín and Loreto to Madre de Dios.

Peru; Bolivia; western Brazil.

This and *L. japurensis* are very closely related. The most effective means of distinguishing them is the character of the stem and petiole scales. Those of *L. nigropaleata* are 1 or 2 mm long, with a usually lustrous black center and ferruginous margin, and are tightly appressed and widely scattered on the stem and the base of the petiole. In *L. japurensis* the scales of the stem are typically 3–5 mm long, rather uniformly dull and reddish or blackish brown, becoming much more numerous on the petiole base, where they are usually spreading and up to 1 cm long.

Other characters are usually helpful in separating the two species: lengths of pinna stalks typically differ as indicated in the key; and pinna base is commonly narrowly cuneate in *L. nigropaleata* but obtuse to broadly cuneate in *L. japurensis*. However, these features are occasionally inconsistent, which suggests that *L. nigropaleata* may be merely a variant of *L. japurensis*.

San Martín: Tarapoto, *Spruce* 4738 (C, K, P, US). **Loreto:** Balsapuerto, lower Río Huallaga basin, *Killip & Smith* 28594 (GH, NY, US). **Huánuco:** Prov. Pachitea, Distr. Honorio, Bosque Nacional de Iparia, *J. Schunke* V. 1288, 1371 (F, GH, US). **Pasco:** Prov. Oxapampa, between Iscozacín and Villa America, *D. Smith* 2835 (F, MO). **Junín:** Prov. Chanchamayo, “Pichanaki” (Dist. Pichanaqui), *van der Werff* et al. 8616 (MO, UC). **Ucayali** (as Loreto): Prov. Coronel Portillo, Bosque Nacional von Humboldt, *Díaz et al.* 729 (MO, US). **Madre de Dios:** Prov. Tambopata, Río Piedras, *Vargas* 18631, 18637 (GH).

XXIV. *Lomagramma*

Lomagramma John Sm., J. Bot. (Hooker) 4:152. 1841. TYPE: *Lomagramma pteroides* John Sm. **Figure 24.**

Plants terrestrial or sometimes epipetric, usually becoming scandent-epiphytic. **Stem** long-creeping or scandent to ca. 20 m long, rather slender, bearing scales and few to many fibrous roots. **Leaves** dimorphic (fertile segments narrower than the sterile), ca. 25 cm to 1.5 m long, widely spaced. **Lamina** 1-pinnate or rarely 2-pinnate, usually im-

paripinnate, the pinnae articulate to the rachis, glabrate to slightly scaly. **Veins** anastomosing but without included free veinlets. **Sporangia** borne over the abaxial surface (acrostichoid) or sometimes on the margin and extending around it onto the edge of the adaxial surface, mixed with usually few paraphyses. **Indusium** lacking. **Spores** monolete, more or less ellipsoidal to spheroidal.

Lomagramma is a tropical genus of about 20 species, but only *L. guianensis* occurs in the Neotropics. The genus is characterized by a scandent-epiphytic, dorsiventral stem, a 1- to 2-pinnate, usually imparipinnate lamina, articulate pinnae, and anastomosing veins. Although *L. guianensis* was formerly treated as a species of *Bolbitis*, it was excluded from that genus by Hennipman in his monograph (1977).

References

HENNIPMAN, E. 1977. A monograph of the fern genus *Bolbitis* (Lomariopsidaceae). Leiden Bot. Ser., 2: 313–314.
HOLTUM, R. E. 1937. The genus *Lomagramma*. Gard. Bull. Straits Settlements, 9: 190–221.
TRYON, R. M., AND A. F. TRYON. 1982. *Lomagramma*, pp. 613–16, in Ferns and allied plants, Springer-Verlag, New York.
1. *Lomagramma guianensis* (Aubl.) Ching, Amer. Fern J. 22: 17. 1932. **Figure 24.**
Polypodium guianense Aubl., Hist. pl. Guiane 2: 962. 1775. TYPE: *Aublet*, French Guiana (isotype, BM; photos, GH, US).
Leptochilus guianensis (Aubl.) C. Chr., Bot. Tidsskr. 26: 288. 1904.
Bolbitis guianensis (Aubl.) Vareschi, Flora Venezuela 1: 376. 1969 (credited to Kramer, Acta Bot. Neerl. 3: 486. 1954, which is invalid; Art. 33.2).

Stem 2–6 mm thick, sparsely scaly, the scales 1–2 mm long, linear-lanceolate, blackish, obscurely clathrate. **Leaves** 1-pinnate, with 10–14 pairs of articulate pinnae and a conform or subconform nonarticulate terminal segment, petiole 8–18 cm long, adult leaves 25–60 cm long, 14–20 cm broad, but fertile ones much smaller. **Rachis** sparsely provided with filiform, tortuous, castaneous scales. **Sterile pinnae** to 15 cm long and 3 cm broad, subsessile, or proximal ones short-stalked, lanceolate, the apices acute to attenuate, the margins subentire to (distally) crenulate-serrate. **Veins**

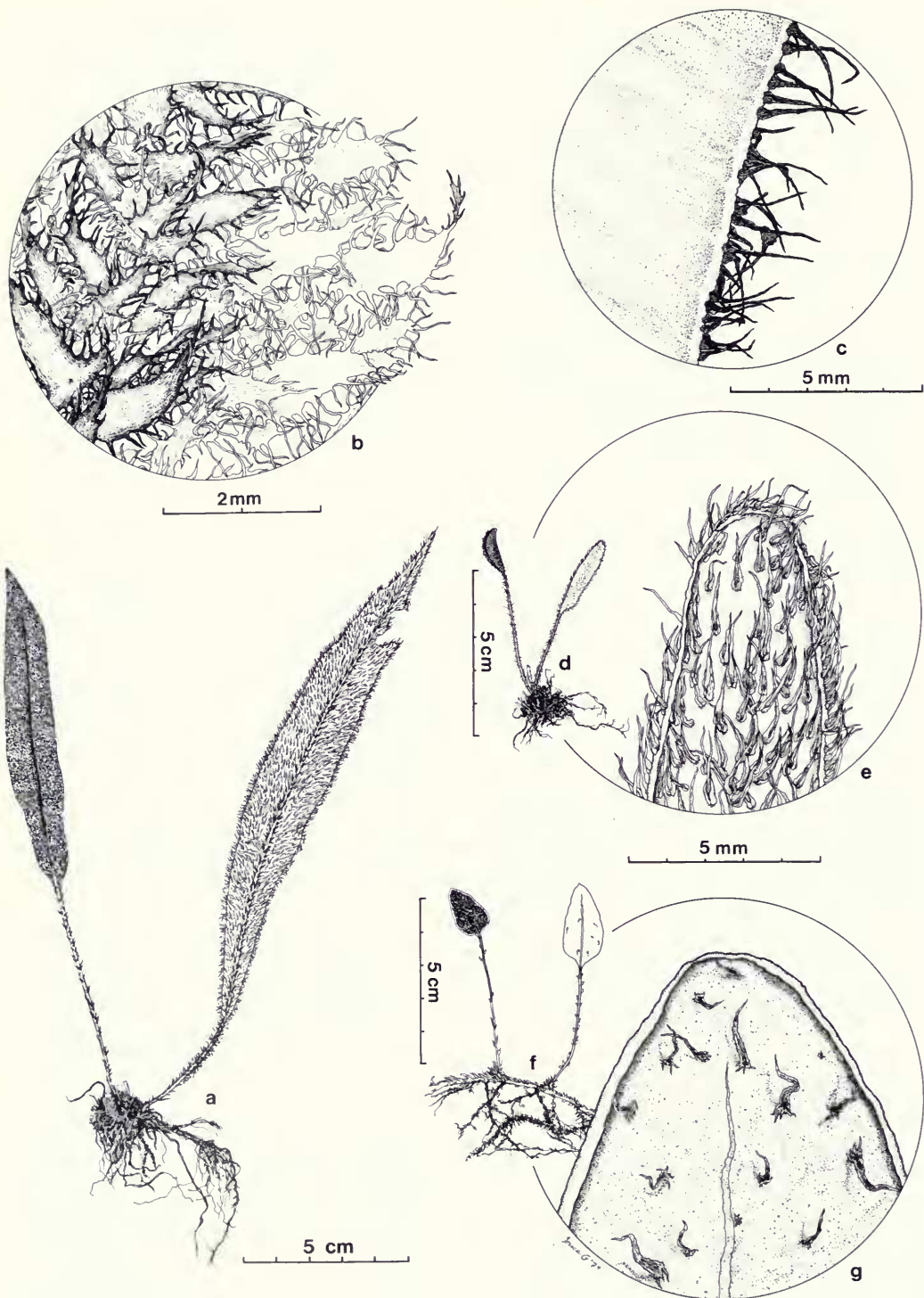


FIG. 25. *Elaphoglossum paleaceum*: a, habit, stem with fertile and sterile leaf; b, scales on abaxial surface. *Elaphoglossum erinaceum*: c, scales of leaf margin. *Elaphoglossum piloselloides*: d, habit, stem with fertile and sterile leaf; e, scales on abaxial surface. *Elaphoglossum squamipes*: f, habit, stem with fertile and sterile leaf; g, scales on abaxial surface. (Adapted from Stolze, Ferns and fern allies of Guatemala, 1981.)

anastomosing throughout, but the tips commonly free at the pinna margin. **Fertile pinnae** linear, 3–10 cm long, 0.2–0.5 cm broad, the tips obtuse or acute, the slender, tawny or light brown paraphyses scattered sparsely among the sporangia.

Terrestrial, commonly becoming scandent on tree trunks, in lowland forests, 100–900 m, Loreto and Huánuco to Madre de Dios.

Greater Antilles (except Jamaica); Colombia to the Guianas, south to Bolivia and Brazil; Argentina.

Plants initially are terrestrial; later they become scandent on trees but retain their terrestrial connection. Stems often creep for long distances, and are slender along the ground but stouter on trees. Fertile leaves most commonly occur on the scandent stems and are often most numerous toward the stem apex.

Loreto: Peña Blanca on Río Ataya, *Killip & Smith 29674* (F, US). **Huánuco:** Prov. Pachitea, Dist. Honoria, Bosque Nacional de Iparia, *Schunke V. 1372* (F, GH, US). **Pasco:** Puerto Bermúdez (as Junín), *Killip & Smith 26572* (F, US). Prov. Oxapampa, Quebrada Castilla, along Río Omaiz, *Léon & Young 1064* (F, USM). Pichis Trail, Santa Rosa (as Junín), *Killip & Smith 26158* (GH, US). **Ucayali:** Prov. Padre Abad, Bosque Nacional von Humboldt, *Narite 3* (USM). **Madre de Dios:** Maldonado, El Pilar, *López & Soukup 4583, 4613* (US).

XXV. *Elaphoglossum*

Contributed by John T. Mickel

Elaphoglossum John Sm., *J. Bot. (Hooker)* 4: 148. 1841, *nom. conserv.* TYPE: *Elaphoglossum conforme* John Sm. **Figure 25.**

Epiphytic, terrestrial, or epipetric. **Stem** compact to long-creeping, horizontal, rarely erect, slender to stout (1–15 mm in diameter). **Stem scales** orange to black, basally attached or peltate, entire to dentate or ciliate. **Leaves** monomorphic or usually more or less dimorphic, 2–200 cm long, erect, spreading or pendent, simple or rarely pedate. **Petiole** glabrous or scaly, sometimes also with minute glandular trichomes, long or very short, base often darker (phyllopodium) with abscission at its upper demarcation rather than at the stem. **Lamina** linear to ovate or oblanceolate, apex acuminate or caudate to obtuse, base rounded (rarely cordate) to long-attenuate or decurrent; costa sulcate adaxially, usually with scales similar to those of the petiole abaxially. **Veins** generally free, rarely anas-

tomosing or with a marginal commissural vein, simple to twice-forked, ending near the margin, those ending well short of the margin usually terminating in conspicuous hydathodes. **Lamina scales** generally differing from those of the stem or petiole, abundant to lacking, often greatly reduced and appearing as stellate trichomes. **Fertile leaves** longer or shorter than the sterile ones but generally with narrowed laminae and proportionally longer petioles. **Fertile lamina** completely covered abaxially with sporangia (acrostichoid sori). **Sporangia** long-stalked, the annulus erect, interrupted by the stalk; paraphyses (in the form of intersporangial scales) present in some species, but generally lacking. **Spores** bilateral, monolete, most with high crests or low ridges, but some echinate or verruculate without ridges or crests.

There are probably well over 600 species in *Elaphoglossum*, more than three-fourths of them occurring in tropical America. There are 121 species recognized in Peru, although our knowledge of them is far from complete. Several are known from only one or a few specimens. The genus is very difficult taxonomically; it has not been adequately treated with a usable subgeneric breakdown until recently. Variation of the characters, such as plant size, lamina form, scale color, and scale type, is not fully understood in terms of species delimitation. The characters lie mostly in the scales of the stem and lamina. The fertile leaves add characters of relative size, intersporangial scales, and spore details, but virtually all the species can be identified on the basis of vegetative material alone. Unfortunately, collectors are hesitant to collect sterile material and thus many records have gone uncollected. The large number of new species described here is a reflection of the enormous diversity within the genus and gives an indication of our heretofore poor knowledge of this fascinating group.

In the following descriptions, the stem diameter is given excluding the scale covering. The stem scales may be appressed or widely spreading and might too greatly distort the stem diameter measurements were they included. In the key and descriptions, the terms “leaves” and “laminae,” when not specifically referring to fertile leaves and laminae, refer to sterile ones, which are much more abundant than the fertile. Petiole bases are differentiated into evident phyllopodia in some but not all species. Although the veins seem to run to the margin in some species, they end just short of it, leaving a pale, thin margin 0.5–1 mm wide, which

is often difficult to distinguish, especially in very coriaceous or heavily indumented leaves. This margin is more readily distinguished in the fertile leaves where it remains sterile in contrast to the acrostichoid sori of the rest of the lower surface. Vein angles and intervein distances are measured at midleaf, halfway between the costa and margin. The scales of the stem and lamina are generally quite distinct from one another, and on the petiole they intergrade or in some cases remain distinct and occur together. The lamina scales, although basically the same type on upper and lower surfaces, are more highly dissected abaxially. In some this means longer teeth, but in more extreme cases they are reduced to stellate trichomes or even to resinous dots. In subglabrous leaves, the lamina scales are reduced further in size to minute stellate trichomes (trichomidia) that are visible only with a lens. On the fertile lamina, the scales adaxially are similar to those of the sterile lamina, but abaxially the scales are generally limited to the costa and in only a few species are there scales among the sporangia. Another type of indument is minute, erect glandular trichomes, which are found in varying degrees on the petiole and occasionally on the lamina in *E. lindenii*, *E. erinaceum*, *E. tam-*

billense, *E. rubellum*, *E. haynaldii*, and their relatives.

In most cases *Elaphoglossum* is distinct in its simple lamina, only rarely becoming pedate or crested, and generally has free veins and acrostichoid sori.

This treatment contains numerous citations from Christ's "Monographie des Genus *Elaphoglossum*," which appeared in the journal *Denkschr. Schweiz. Naturf. Ges.* 36. 1899. In the interest of brevity the publication is cited throughout as *Monogr. Elaphoglossum*.

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MICKEL, J. T., AND L. ATEHORTUA G. 1980. Subdivision of the genus *Elaphoglossum*. *Amer. Fern J.*, 70: 47–68.

Key to Species of *Elaphoglossum*

- a. Sterile leaf bearing linear-lanceolate scales that are usually inrolled to appear hairlike (subulate), at least on petiole but generally throughout the leaf, and/or with veins ending in hydathodes b
- b. Hydathodes lacking; leaves (25–)35+ cm long c
- c. Petiole lacking; lamina narrowly oblanceolate; lamina scales orange d
- d. Stem scales slightly sinuous; sterile lamina 12–56 × 1.7–6.0 cm; lamina apex acuminate to long-caudate; spore ridges smooth, surrounding a perforated area 97. *E. raywaense*
- d. Stem scales conspicuously flexuous; sterile lamina 45–95 × 7.7–9.5 cm; lamina apex acuminate to sharply cuspidate; spore ridges short-spiny, surrounding an area with fine spines 3. *E. amazonicum*
- c. Petiole present; lamina narrowly elliptic to lanceolate (rarely oblanceolate); lamina scales black to dark brown e
- e. Lamina scales very sparse, deciduous 93. *E. propinquum*
- e. Lamina scales conspicuous f
- f. Lamina base attenuate g
- g. Lamina narrowly oblanceolate, 4.6–6.3 cm broad; petiole scales dense, 4–5 mm long 12. *E. blepharoglottis*
- g. Lamina linear-elliptic, 1.4–1.7 cm broad; petiole scales sparse, 1–2 mm long 44. *E. hystrix*
- f. Lamina base rounded to subcordate h
- h. Lamina base rounded; 700–3325 m elev. 28. *E. erinaceum*
- h. Lamina base truncate to subcordate; 200–3200 m elev. 11. *E. barbatum*

- b. Hydathodes present, or if lacking, leaves only 6–15 cm long i
- i. Stem long-creeping, petioles 0.5–3 cm apart j
- j. Lamina oblong-ovate, 6.5–12 cm broad, lamina base deeply cordate ... 86. *E. pascoense*
- j. Lamina elliptic to linear-elliptic, 1.2–4.8 cm broad; lamina base cuneate to truncate ... k
- k. Lamina scales dark brown, curved; leaves 6–12 cm long 13. *E. camptolepis*
- k. Lamina scales orange to dark brown, straight; leaves 14–40 cm long l
- l. Stem 1–2 mm in diameter m
- m. Leaves 8–12 cm long, 0.6–1.3 cm broad; petiole 0.5–0.7 mm in diameter; fertile lamina 1.5–2.5 cm long 35. *E. gracillimum*
- m. Leaves 30–47 cm long, 1.8–3.0(4.8) cm broad; petiole 1.4–1.7 mm in diameter; fertile lamina 11–13 cm long 50. *E. latevagans*
- l. Stem 3–4 mm in diameter n
- n. Sterile lamina chartaceous, margin crenulate, base truncate; petiole ca. $\frac{1}{2}$ the sterile leaf length, 0.8–1.0 mm in diameter; petiole scales patent, dark brown 105. *E. simulans*
- n. Sterile lamina subcoriaceous, margin entire, base rounded; petiole $\frac{1}{4}$ – $\frac{1}{3}$ the sterile leaf length, 1–1.5 mm in diameter; petiole scales appressed to ascending, orange 82. *E. pachyrrhizum*
- i. Stem short-creeping, petioles less than 0.5 cm apart o
- o. Leaves 15–70 cm long, or if smaller, lamina scales 3–5 mm long p
- p. Leaves nearly sessile, petiole nearly lacking or winged; lamina with white patches between veins q
- q. Lamina linear-oblongate; petiole essentially lacking 19. *E. zebrinum*
- q. Lamina elliptic to oblanceolate; petiole winged to base 2. *E. alipes*
- p. Leaves distinctly petiolate; lamina lacking regular white patches between veins r
- r. Petiole $\frac{1}{4}$ or more of total leaf length; lamina lanceolate to elliptic, (2)3–10 cm broad (rarely linear), 1.1–1.6 cm broad; lamina and petiole scales linear-lanceolate to lanceolate, plane, rarely subulate s
- s. Leaves 70–110 cm long, lamina 8.0–12.8 cm broad, with subulate scales 10. *E. bakeri*
- s. Leaves 16–55(–75) cm long; lamina 2.2–7.8 cm wide, with lanceolate or linear-lanceolate scales (rarely subulate in *E. rufum*) t
- t. Lamina 3–8 cm broad u
- u. Lamina with sparse scales ca. 1 mm long; leaves 32–75 cm long v
- v. Petiole black, especially of the fertile leaves 15. *E. castaneum*
- v. Petiole of both sterile and fertile leaves dull gray-green 85. *E. papillosum*
- u. Lamina with abundant scales 2–3 mm long; leaves 22–30 cm long w
- w. Lamina elliptic, never proliferous; intersporangial scales black 1. *E. albescens*
- w. Lamina lanceolate, usually proliferous at apex; intersporangial scales orange-tan x
- x. Scales of petiole and lamina margin subulate; petiole scales spreading, abundant; intersporangial scales sparse to lacking 102. *E. rufum*
- x. Scales of petiole and lamina margin lanceolate; petiole scales appressed, scattered; intersporangial scales abundant 117. *E. wardiae*
- t. Lamina 2.0–2.4 cm broad y
- y. Sterile lamina rounded at base 24. *E. diversifrons*
- y. Sterile lamina attenuate at both ends z
- z. Petioles pale; lamina scales orange-tan, scattered ... 80. *E. oxyglossum*
- z. Petioles black; lamina scales dark red-brown, very sparse 68. *E. moyeri*

- r. Lamina linear to narrowly elliptic, 0.6–3.2 cm broad; petiole scales subulate or lanceolate a2
 - a2. Lamina scales (other than costal) less than 1 mm long, entire b2
 - b2. Petiole scales subulate to lanceolate, spreading; stem scales linear-lanceolate, spreading c2
 - c2. Petiole and costal scales dark red-brown, subulate .. 30. *E. eximium*
 - c2. Petiole and costal scales tan, lanceolate 84. *E. palorense*
 - b2. Petiole and stem scales ovate, appressed d2
 - d2. Lamina undivided, entire 103. *E. russelliae*
 - d2. Lamina pedately lobed (5–7 lobes) 14. *E. cardenasii*
 - a2. Lamina scales over 2 mm long, denticulate e2
 - e2. Lamina scales 3–6 mm long; fertile lamina round to oblong, obtuse; fertile leaf much shorter than the sterile f2
 - f2. Lamina apex acuminate to acute-cuspidate, 1.3–2.4 cm wide; base cuneate; glandular trichomes to 0.5 mm long; 1500–2450 m elev. 39. *E. haynaldii*
 - f2. Lamina apex acute to obtuse, 2.1–3.2 cm wide; base rounded; glandular trichomes ca. 0.2 mm long; 400–500 m elev. 100. *E. rubellum*
 - e2. Lamina scales 1–2 mm long; fertile lamina lanceolate to long-oblong, about equal to sterile leaf or longer. g2
 - g2. Lamina 1.7–2.4(3.6) cm wide; fertile lamina truncate at base, 1.8–2.3 cm wide 104. *E. setigerum*
 - g2. Lamina 0.9–1.6 cm wide; fertile lamina rounded at base, 0.6–1.6 cm wide h2
 - h2. Leaves 28–38 cm long; lamina apex acuminate; petiole ca. $\frac{1}{4}$ the leaf length; stem scales 3–5 mm long; veins 2–3 mm apart; lamina scales subulate, dark brown 92. *E. poeppigianum*
 - h2. Leaves 11–21(32) cm long; lamina apex acute to obtuse-apiculate; petiole $\frac{1}{3}$ – $\frac{1}{2}$ the leaf length; stem scales to 13 mm long; veins 1 mm apart; lamina scales linear, orange-tan 96. *E. quitense*
- o. Leaves 2–16 cm long; lamina scales 1–2(3) mm long i2
 - i2. Lamina ovate to lanceolate, 1.4–2.7 cm wide, cuspidate or rarely acuminate j2
 - j2. Lamina truncate to subcordate at base; petiole and lamina conspicuously scaly .. 90. *E. pilosius*
 - j2. Lamina broadly cuneate to rounded at base; petiole and lamina sparsely scaly to glabrous k2
 - k2. Lamina sparsely scaly, minute glandular trichomes sparse ... 56. *E. lindenii*
 - k2. Lamina lacking scales but with abundant minute glandular trichomes, especially at lamina base and upper petiole 109. *E. tambillense*
 - i2. Lamina linear to spatulate, 0.4–1.0 cm wide, obtuse l2
 - l2. Lamina linear-elliptic; leaves 7–13 cm long 42. *E. horridulum*
 - l2. Lamina obovate-oblongate to narrowly elliptic; leaves 2–4(–8) cm long ... m2
 - m2. Fertile lamina narrowly oblongate, much longer than broad, often inrolled, base cuneate 46. *E. hieracioides*
 - m2. Fertile lamina orbicular to ovate, flat or conduplicate, base rounded, rarely cuneate n2
 - n2. Leaves 2–4(6) cm long; sterile lamina spatulate; fertile lamina rounded, strongly conduplicate, with distinctly darker scales than those of sterile leaf; hydathodes very inconspicuous to lacking 89. *E. piloselloides*
 - n2. Leaves 7–15 cm long; sterile lamina elliptic to oblong; fertile lamina orbicular, flat, with scales same color as those of sterile lamina; hydathodes evident 38. *E. hayesii*

- a. Sterile leaf densely scaly to virtually glabrous; scales various (broadly lanceolate or ovate, ciliate, stellate, round-peltate) but not subulate; hydathodes lacking (except in *E. mathewsii* and *E. hartwegii*) o2
- o2. Scales, stellate trichomes, or glandular dots present on lamina and petiole; if lamina scales sparse, lamina chartaceous, not coriaceous p2
- p2. Lamina scales limited to margin and midvein, laminar surface lacking any form of scale (including resinous dots) q2
- q2. Lamina scales golden, round, entire; petiole $\frac{1}{4}$ – $\frac{1}{3}$ the sterile leaf length; sterile lamina cuspidate 21. ***E. decoratum***
- q2. Lamina scales tan-orange, lanceolate, deeply dentate; petiole $\frac{1}{8}$ – $\frac{1}{6}$ the sterile leaf length; sterile lamina broadly obtuse 35. ***E. obtusum***
- p2. Lamina scales not limited to margin and costa, with some form of scale, although perhaps very sparse, on the laminar surface r2
- r2. Abaxial surface with stellate trichomes and/or resinous dots s2
- s2. Abaxial surface with stellate trichomes, sometimes mixed with resinous dots, or with small, loosely attached scales with resinous dots t2
- t2. Abaxial surface with scales, stellate trichomes rare or lacking u2
- u2. Stem compact; stem scales reddish black, indurated, ascending; petiole $\frac{1}{3}$ the sterile leaf length 70. ***E. nastukiae***
- u2. Stem long-creeping; stem scales black, thin, recurved; petiole $\frac{1}{2}$ – $\frac{3}{5}$ the sterile leaf length v2
- v2. Leaves 2–3.5 cm long, ovate-acuminate; lamina scales lanceolate, long-ciliate 45. ***E. jucundum***
- v2. Leaves 15–35 cm long, narrow-elliptic; lamina scales ovate, linear or linear-lanceolate, entire or ciliate only at scale base w2
- w2. Lamina scales ovate (or ovate-deltate to ovate-lanceolate), entire; petiole scales imbricate. 95. ***E. punae***
- w2. Lamina scales linear adaxially, linear-lanceolate abaxially, short-ciliate at scale base; petiole scales scattered 59. ***E. longius***
- t2. Abaxial lamina surface with stellate trichomes (rarely just resinous dots; see couplet y2) x2
- x2. Scales of petiole and costa (and adaxial lamina surface) round, fimbriate; those of petiole and abaxial costa often bicolorous (dark-centered with white fringe) y2
- y2. Abaxial surface with stellate trichomes 110. ***E. tectum***
- y2. Abaxial surface with resinous dots 107. ***E. stenophyllum***
- x2. Scales of petiole and lamina (especially abaxial costa) lanceolate to roundish or stellate, neither conspicuously round and fimbriate nor bicolorous, though some may be dark and araneiform z2
- z2. Lamina narrowly elliptic, 6–19 mm wide; costa and petiole with some dark appressed araneiform scales 6. ***E. angustius***
- z2. Lamina linear to narrow-elliptic, 4–6(–9) mm wide; costa and petiole scales stellate to lanceolate, lacking dense, araneiform scales a3
- a3. Lamina and petiole scales with noticeable scale body, adaxial scales peltate, round to ovate; abaxial scales all stellate; petiole with linear-lanceolate scales 94. ***E. pumilio***
- a3. Lamina and petiole scales on both surfaces all stellate b3
- b3. Adaxial lamina indument strictly stellate trichomes; fertile leaf shorter than sterile; petiole ca. 0.5 mm diameter, $\frac{1}{3}$ – $\frac{1}{2}$ sterile leaf length; sterile leaves 9–13(–30) cm long, 4–20 mm broad; terrestrial, at 1500–3650 m 112. ***E. tenuiculum***
- b3. Adaxial lamina indument with slight scale body in center;

- fertile leaf longer than sterile; petiole 0.6–0.9 mm diameter, ca. $\frac{1}{2}$ the sterile leaf length; sterile leaves 7.5–10 cm long, 2.5–3 mm broad; epiphytic, at 900–1300 m 46. *E. killipii*
- s2. Abaxial lamina surface with resinous dots, lacking scales and stellate trichomes c3
- c3. Lamina elliptic, 60–75 cm long, 3.4–4.6 cm wide; stem compact 19. *E. craspedotum*
- c3. Lamina linear to narrowly elliptic, 12–44 (to 78 in *E. ciliatum*) cm long, 0.8–2.3(–3.0) cm wide; stem short-creeping d3
- d3. Lamina subsessile, $\frac{1}{30}$ – $\frac{1}{5}$ the sterile leaf length; veins conspicuous, 2 mm apart 72. *E. nigrescens*
- d3. Lamina distinctly petiolate, $\frac{1}{4}$ – $\frac{2}{3}$ the sterile leaf length; veins inconspicuous, ca. 1 mm apart e3
- e3. Lamina long-cuspidate or acuminate (rarely obtuse); adaxial lamina surface with scattered to abundant hair-toothed scales 88. *E. petiolosum*
- e3. Lamina narrowly obtuse to acute; adaxial lamina scales entire to erose or with only short teeth f3
- f3. Lamina nearly scaleless above with only scattered 1 mm scales, especially near margin; 400–2650 m elev. g3
- g3. Stem long-creeping, naked, glutinous; phyllopodia long; epiphytic at 400–2650 m 17. *E. ciliatum*
- g3. Stem short-creeping; phyllopodia short; terrestrial at 2050–3200 m 43. *E. huacsaro*
- f3. Lamina scaly adaxially, usually densely so, scales deltate-lanceolate, often bicolorous, ca. 2 mm long; 3200–5100 m elev. ... h3
- h3. Lamina scales entire to erose 37. *E. hartwegii*
- h3. Lamina scales denticulate, ciliate, at least at base 62. *E. mathewsii*
- r2. Abaxial surface with round to lanceolate scales (often glabrous in *E. mathewsii*, *E. hartwegii*, and *E. litantum*), lacking stellate trichomes and resinous dots i3
- i3. Abaxial surface with round, ciliate, peltate scales; stem scales weakly dentate to entire j3
- j3. Scales of abaxial surface white, irregular, round, peltate to ovate, variably dentate to ciliate; petiole and abaxial costa scales pale, concolorous; lamina narrowly cuneate at base, apex long-acuminate; stem compact, petioles approximate .. 47. *E. laminarioides*
- j3. Scales of abaxial surface mostly reddish, scattered, dark; petiole and abaxial costal scales black with white, fimbriate margin; lamina broadly cuneate at base, apex cuspidate to acuminate; stem creeping, petioles 0.5–2 cm apart 20. *E. cuspidatum*
- i3. Abaxial surface with lanceolate, cilio-denticulate scales; adaxial the same or glabrous; stem scales strongly cilio-denticulate k3
- k3. Lamina linear, 30–45 cm long, 0.4–0.6(–1.0) cm wide l3
- l3. Abaxial lamina scales long-ciliate (cilia longer than scale body is wide), appearing as a dense, woolly mat; lamina 5–10 mm wide 16. *E. chloödes*
- l3. Abaxial lamina scales short-ciliate (cilia much shorter than scale body is wide), appressed, not a woolly mat; lamina 4–5 mm wide 115. *E. vittarioides*
- k3. Lamina elliptic to narrowly elliptic, 1–6 cm broad m3
- m3. Lamina scales undivided (entire, erose to denticulate), not long-ciliate along scale margin, although sometimes ciliate at base, generally dark with pale margin n3

- n3. Stem long-creeping; abaxial lamina surface densely scaly 99. *E. rosenstockii*
- n3. Stem short-creeping; abaxial lamina surface lacking scales See couplet h3
- m3. Lamina scale margins ciliate or coarsely dentate o3
 - o3. Stem long-creeping, petioles mostly 5–20 mm apart p3
 - p3. Lamina scales dense, imbricate, surface not or barely visible; lamina lanceolate, long-acuminate 55. *E. leprosum*
 - p3. Lamina scales scattered to sparse, surface visible; lamina elliptic to linear-elliptic, apex obtuse to acuminate q3
 - q3. Leaves 55–86 cm long, 3.5–5.6 cm broad; abaxial lamina lacking scales other than sparse, lanceolate ones along costa; lamina margin with dense orange scales 0.5–1 mm long 5. *E. amplum*
 - q3. Leaves less than 53 cm long, mostly less than 35 cm long, 2.0–4.1 cm broad; abaxial lamina surface scaly, margin not densely orange-scaly r3
 - r3. Stem 2–3 mm in diameter s3
 - s3. Stem scales strongly dentate ... 53. *E. laxisquama*
 - s3. Stem scales entire to sparsely denticulate t3
 - t3. Phyllopodia 2–3.8 cm long; lamina apex acuminate; petiole and costal scales linear-lanceolate, brown to tan, not sclerotic 32. *E. fortipes*
 - t3. Phyllopodia 1.2–2.2 cm long; lamina apex acute to obtuse; petiole and costal scales black, sclerotic, usually appressed ... 116. *E. vulcanicum*
 - r3. Stem 1–2 mm in diameter u3
 - u3. Lamina 0.4–0.6 cm wide, leaf 8–16 cm long; abaxial surface scaly, scales overlapping, curled, ciliate-dentate 111. *E. tenue*
 - u3. Lamina 1.0–2.5 cm wide, leaf 14–34 cm long; abaxial surface glabrous or glandular v3
 - v3. Lamina abundantly glandular abaxially; lamina apex acuminate; petiole $\frac{1}{2}$ – $\frac{3}{5}$ the sterile leaf length See couplet u2
 - v3. Lamina eglandular; lamina apex acute to obtuse; petiole $\frac{1}{3}$ – $\frac{1}{2}$ the sterile leaf length 116. *E. vulcanicum*
- o3. Stem compact, leaves approximate, 0–2 mm apart w3
 - w3. Lamina apex acuminate, or if only acute, stem scales with widely spreading, long, hairlike teeth x3
 - x3. Stem scales maroon, linear, 12–20 mm long y3
 - y3. Lamina scales imbricate, appressed; lamina 25–36 cm long; petiole scales appressed to ascending; 1100–2750 m elev. 29. *E. erythrolepis*
 - y3. Lamina scales loosely arranged; lamina (30–)52–66 cm long; petiole scales widely spreading; 3400–3750 m elev. 101. *E. ruficomus*
 - x3. Stem scales orange to black, linear-lanceolate to lanceolate, 1–6 mm long, often with hairlike teeth z3
 - z3. Petiole $\frac{1}{20}$ – $\frac{1}{6}$ ($\frac{1}{4}$) the sterile leaf length a4
 - a4. Lamina apex abruptly long-acuminate; stem scales

- 1 mm long, brown, entire, somewhat resinous; stem
2 mm in diameter 63. *E. megalurum*
- a4. Lamina gradually diminishing at apex; stem scales
4–7 mm long, orange to orange-tan or dark brown,
long-ciliate or entire; stem 5–10 mm in diameter
..... b4
- b4. Stem scales dark reddish brown, very indurated, entire; stem ca. 5 mm in diameter; sterile lamina glabrous abaxially, costa with minute, ciliate scales, glabrescent adaxially except for dense, cilio-denticulate, 1 mm long, pale scales at margin 58. *E. litanum*
- b4. Stem scales orange to orange-tan, thin, long-ciliate; stem ca. 10 mm in diameter; lamina densely ciliate-scaly on both surfaces c4
- c4. Lamina apex acute, the scales lanceolate, 6–12 cells wide; petiole terete 91. *E. plumosum*
- c4. Lamina apex acuminate, the scales skeletonized, 3 cells wide, petiole flattened ..
..... 9. *E. auricomum*
- z3. Petiole $\frac{1}{4}$ – $\frac{2}{5}$ sterile leaf length or, if shorter, at least some petioles of the same plant longer d4
- d4. Stem scales orange to black, entire or weakly provided with lax, hairlike teeth e4
- e4. Stem scales with lax, tan trichomes; lamina scales appressed 79. *E. orbignyanum*
- e4. Stem scales entire; lamina scales loose
..... 40. *E. hickenii*
- d4. Stem scales black, with stiff, black, hairlike teeth
..... f4
- f4. Lamina elliptic; costal scales orange
..... 83. *E. paleaceum*
- f4. Lamina linear-elliptic; costal scales black .. g4
- g4. Lamina scales dense; costal scales lanceolate, 2–3 mm long 98. *E. rimbachii*
- g4. Lamina scales scattered; costal scales arachnidoid, 0.5–1 mm long
..... 36. *E. guamanianum*
- w3. Lamina apex obtuse to acute, stem scales entire to weakly dentate or with long-ascending hairlike teeth h4
- h4. Lamina (10–)14–33 mm broad, with orange to maroon scales
..... i4
- i4. Abaxial lamina scales black, appressed
..... 7. *E. atropunctatum*
- i4. Abaxial lamina scales orange (or black only on costa), loosely arranged j4
- j4. Leaves 65–70 cm long, 5.5–6 cm broad; fertile leaf linear 22. *E. dichroum*
- j4. Leaves 17–47 cm long, 1.4–2.7 cm broad; fertile leaf elliptic k4
- k4. Larger petiole scales long-ciliate
..... 26. *E. engelii*

- k4. Larger petiole scales erose to very short-ciliate 14
 14. Lamina scales scattered, greatly reduced, sometimes nearly to stellate trichomes; costal scales black; petiole scales black with white margin 76. **E. oculatum**
 14. Lamina scales abundant; petiole and costal scales concolorous, orange-tan 69. **E. muscosum**
 h4. Lamina 4–12 mm wide, or if broader (to 22 mm), with black stem scales m4
 m4. Stem scales castaneous to dark red-brown n4
 n4. Lamina 4–7 mm wide; costal and laminar scales linear-lanceolate, laminar ones with hairlike teeth much longer than scale body is wide 113. **E. tomentellum**
 n4. Lamina 6–12 mm wide; costal scales ovate to lanceolate, ciliate, black, lightly appressed, the hairlike teeth about half as long as scale body is wide 49. **E. lasioglottis**
 m4. Stem scales black o4
 o4. Lamina narrowly elliptic, 8–15 mm broad; laminar scales erect, nearly round with cilia longer than scale body 48. **E. lanatum**
 o4. Lamina elliptic, 12–22 mm wide; laminar scales appressed, imbricate, lanceolate, erose to short-ciliate 73. **E. nivosum**
 02. Scales lacking on lamina and petiole except rarely some minute, stellate trichomes or a few scales at petiole base; if lamina scales generally distributed abaxially or along margin, lamina very coriaceous; stem and lamina scales not regularly dentate, only occasional processes or weak trichomes along margin p4
 p4. Stem 4–10 mm in diameter r4
 q4. Lamina nearly sessile, petiole less than $\frac{1}{10}$ the sterile leaf length r4
 r4. Lamina coriaceous, with scales, especially toward lamina base and petiole; fertile lamina 3–3.6 cm wide 60. **E. luridum**
 r4. Lamina chartaceous, this and petiole lacking scales; fertile lamina 2–2.8 cm wide s4
 s4. Lamina 4.0–5.2 cm wide, apex acute; petiole of sterile leaf ca. 1 cm long; stem scales orange; fertile lamina 2 cm wide. 71. **E. nidiformis**
 s4. Lamina 1.9–2.4 cm broad, apex acuminate; petiole of sterile leaf 2–3(–6) cm long; stem scales dark brown; fertile lamina 2.3–2.8 cm broad 52. **E. lawyeriae**
 q4. Lamina elliptic, with distinct petiole $\frac{1}{8}$ or more the sterile leaf length t4
 t4. Lamina surface abaxially with conspicuous reddish brown, skeletonized scales; lamina very coriaceous, blue-green adaxially when fresh 66. **E. metallicum**
 t4. Lamina surface abaxially lacking conspicuous scales; lamina chartaceous to coriaceous, not distinctly blue-green when fresh u4
 u4. Stem erect, a slender trunk 30–90 cm long; petiole $\frac{1}{8}$ – $\frac{1}{4}$ the sterile leaf length; lamina oblanceolate 54. **E. lechlerianum**
 u4. Stem horizontal; petiole $\frac{1}{4}$ or more the sterile leaf length; lamina elliptic or linear v4
 v4. Stem long-creeping; lamina punctate with glands or stellate trichomidia w4

- w4. Abaxial lamina surface with stellate trichomidia; leaves 60–75 cm long; fertile lamina linear 118. **E. williamsiorum**
- w4. Abaxial lamina surface with glandular dots, sometimes with adhering spores making them appear black; leaves 25–41 cm long; fertile lamina elliptic, similar in size and shape to the sterile 64. **E. meladenium**
- v4. Stem compact to moderately creeping x4
 - x4. Lamina linear, 1.8–2.1 cm wide; stem scales orange and on petiole beyond phyllopodia 114. **E. velongum**
 - x4. Lamina elliptic to ovate-lanceolate, 4.9–15 cm wide; stem scales dull brown to blackish, rarely orange, not covering phyllopodia y4
 - y4. Lamina ovate-lanceolate, 9–15 cm wide, abaxial surface with fine, dissected, hairlike scales along costa 81. **E. pachyphyllum**
 - y4. Lamina elliptic, 4.9–9.8 cm wide, abaxial surface glabrous or with occasional lanceolate scales along costa near lamina base 51. **E. latifolium**
- p4. Stem 1–3(–4) mm in diameter z4
 - z4. Stem long-creeping, petioles often over 1 cm apart a5
 - a5. Stem 1–1.5 mm in diameter; stem and petiole scales tan; leaves 2–11 cm long; phyllopodia lacking b5
 - b5. Lamina lanceolate-ovate to lanceolate, oblanceolate, or suborbicular, apex obtuse c5
 - c5. Lamina lanceolate to ovate-lanceolate; leaves 7–12 cm long; abaxial lamina scales inconspicuous, tan, not sclerotic 106. **E. squamipes**
 - c5. Lamina ovate to oblanceolate or suborbicular, 1.3–2.4(–3.5) cm long, with dark brown to black sclerotic scales, especially abaxially 18. **E. concinnum**
 - b5. Lamina elliptic to narrowly lanceolate, apex acuminate d5
 - d5. Leaves (9–)21–24 cm long, 1.4–2.0 cm wide; petiole scales appressed to ascending, 3–4 mm long; lamina apex acuminate; lamina scales scattered 27. **E. ensiforme**
 - d5. Leaves 7–12 cm long, 0.7–1.1 cm wide; petiole scales widely spreading, 2–3 mm long; lamina apex acute to acuminate, lamina scales sparse, mostly along costa 61. **E. macilentum**
 - a5. Stem (1.5–)2–3 mm in diameter; stem scales black to tan, sparse; leaves 15–38 cm long; phyllopodia present e5
 - e5. Stem scales lustrous, strongly spreading, blackish brown, not sclerotic f5
 - f5. Lamina lanceolate, 28–48 cm wide 65. **E. melancholicum**
 - f5. Lamina linear-elliptic, 10–13 cm wide 8. **E. atosquamatum**
 - e5. Stem scales dull to lustrous, orange-tan to black, obviously sclerotic, not strongly spreading (except in *E. patinii*) g5
 - g5. Stem scales lanceolate, mostly 2–3 mm long, orange-tan to dark brown, thin or sclerotic; leaf apex acute to acuminate; 1200–3500 m elev. ... h5
 - h5. Sterile lamina ovate, 5.5–6.5 cm broad 78. **E. oöphyllum**
 - h5. Sterile lamina elliptic to lanceolate or oblanceolate, 1.7–5.5 cm broad i5
 - i5. Sterile lamina linear-elliptic, 1.7–2.0 cm broad; stem scales orange-tan, widely spreading 87. **E. patinii**
 - i5. Sterile lamina elliptic, lanceolate or oblanceolate, 2.2–5.5 cm broad; stem scales orange-tan to black, appressed or slightly ascending j5
 - j5. Abaxial lamina surface with black, coarsely dentate scales and/or conspicuous, black, stellate trichomidia 77. **E. odontolepis**

- j5. Abaxial lamina surface glabrous or with minute trichomidia inconspicuous to the naked eye 34. *E. glossophyllum*
- g5. Stem scales deltate to lanceolate, 0.5–1.5 mm long, black, sclerotic; leaf apex obtuse or long-acuminate; 300–2200 m elev. k5
- k5. Lamina narrowly elliptic, chartaceous, apex long-acuminate, base attenuate 4. *E. amphioxys*
- k5. Lamina ovate to lanceolate or oblong, coriaceous, apex obtuse to acute, base narrowly to broadly cuneate 57. *E. lingua*
- z4. Stem short-creeping or compact; petioles generally 1–5 mm or less apart, rarely 1 cm apart 15
- 15. Lamina very broadly lanceolate, 50–100 cm long, (5.5)9–15 cm broad; lamina base usually broadly rounded 81. *E. pachyphyllum*
- 15. Lamina linear, elliptic or oblanceolate, less than 42 cm long, 5 cm broad; lamina base cuneate to attenuate m5
- m5. Lamina apex broadly obtuse; lamina obovate, margin with dissected orange scales 74. *E. obovatum*
- m5. Lamina apex narrowly obtuse to acuminate or cuspidate; lamina elliptic to linear or narrowly oblanceolate; scales lacking to lightly distributed abaxially, not concentrated on margin n5
- n5. Lamina margin much thickened or inrolled, lamina lanceolate-acuminate to obovate-obtuse-cuspidate, lustrous, glabrous, or with scattered stellate trichomidia; stem scales orange, linear, with irregular processes 108. *E. styriacum*
- n5. Lamina margin not thickened, dull below; lamina linear to elliptic or oblanceolate o5
- o5. Lamina linear or linear-elliptic, 5–10(16) mm wide p5
- p5. Stem scales concolorous, black to dark brown, often with marginal row of light brown cells; lamina glabrous 32. *E. glabellum*
- p5. Stem scales tan or with varying degrees of black streaks; lamina minutely punctate, rarely with small stellate trichomes like tufts of wool 67. *E. minutum*
- o5. Lamina elliptic or oblanceolate, (16–)20–48 mm wide q5
- q5. Lamina oblanceolate; leaf nearly sessile, petiole ca. $\frac{1}{20}$ the leaf length 31. *E. flaccidum*
- q5. Lamina elliptic; leaf distinctly petiolate; petiole $\frac{1}{5}$ – $\frac{1}{2}$ the leaf length r5
- r5. Stem scales reddish orange; lamina abruptly decurrent; petiole about half the sterile leaf length 23. *E. discolor*
- r5. Stem scales dark brown; lamina abruptly to gradually narrowed at base s5
- s5. Lamina elliptic to broadly so, 2.7–4.8(–7.5) cm broad, abruptly (to gradually) narrowed and slightly decurrent at base; petiole $\frac{1}{4}$ – $\frac{1}{3}$ the sterile leaf length 25. *E. elegantipes*
- s5. Lamina narrowly elliptic, 1.6–2.5 cm broad, gradually tapering at base; petiole $\frac{1}{5}$ the sterile leaf length 32. *E. glabellum*

1. *Elaphoglossum albescent* (Sodirol) Christ,
Monogr. Elaphoglossum 123. f. 68. 1899.

Acrostichum albescent Sodirol, Recens. crypt. vasc.
Quit. 75. 1883. SYNTYPES: Ecuador, en el valle

de Lloa, Sodirol (not located); cerca de Chillanos,
Sodirol (not located).

Stem creeping, 3–4 mm in diameter, with white
blotches on it, the petiole and the lamina scales

linear, lustrous, blackish maroon, 2–3 mm long, entire or with sparse teeth. **Phyllopodia** lacking. **Leaves** slightly apart, 16–40 cm long, 2.2–3.7 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{2}{3}$ the sterile leaf length, scales linear, dark (or with pale tip), lustrous, to 4 mm long, minutely serrulate, appressed to ascending. **Lamina** elliptic, chartaceous, apex acuminate to caudate, base broadly cuneate to rounded. **Veins** obscure, ca. 1 mm apart, at 70–80 degree angle. **Hydathodes** present. **Lamina scales** linear, brown, lustrous, to 3 mm long, scattered on laminar surface, to 5 mm on margin, more abundant on margin. **Fertile leaves** longer than the sterile, petiole $\frac{1}{4}$ the fertile leaf length, scales black and with more pronounced teeth, scales black on costa and mixed with the sporangia.

Terrestrial and epiphytic in wet forest, 1700–3450 m, Amazonas, San Martín, Huánuco, Cuzco, Colombia; Ecuador; Peru.

Although the material cited here is relatively uniform, there are a few specimens that do not fit well into this species. For example, *Young 1950* (USM) (San Martín: Mariscal Cáceres) has the petiole subglabrous but with scattered black scales, the lamina is adaxially glabrous and abaxially with scales scattered, black, lanceolate, 2–3 mm long. Further, *Plowman & Davis 4802* (GH) (Cuzco: La Convención) has petiole with scales dark, more or less appressed, the leaf is very large (to 64 cm long, 9.5 cm broad) with scales dark, 1.5–2 mm long. These may represent distinct species. There are additional variations from Ecuador. More study is needed of *E. albescens* throughout its range to determine how many taxa might be recognized in this complex.

Amazonas: Chachapoyas, Cerros Calla Calla, on road to Leimebamba, *Hutchinson & Wright 5797* (F, GH in part, MO, P, UC, US). **San Martín:** Mariscal Cáceres, NW corner of Río Abiseo Nat. Park, *Young 4462* (USM). **Huánuco:** Muña, *Bryan 549* (F). **Cuzco:** La Convención, Valle de Santa Ana, above Quillabamba, *Plowman & Davis 4802* (GH).

2. *Elaphoglossum alipes* Mickel, *sp. nov.*

Inter species squamis subulatis provisitis stipite alato unicum.

Stem short-creeping, 2–3 mm in diameter, scales linear-deltate, lustrous, blackish maroon, 1.5–2 mm long, entire. **Phyllopodia** lacking. **Leaves** 1–2 mm apart, 18–26 cm long, 2.7–3.9 cm broad. **Pet-**

iole lacking. **Lamina** oblanceolate, membranous, apex acute, base narrowed to a wing about $\frac{1}{3}$ the sterile leaf length. **Veins** evident, free, 1.5–2 mm apart, at 70 degree angle. **Hydathodes** present. **Lamina scales** scattered on both surfaces, subulate, tan, 2 mm long on surfaces, 3 mm long on margin. **Fertile leaves** unknown.

TYPE—Peru, Ucayali (as Loreto), along Río Aguetia (Aguaytia) above mouth of Quebrada Yurac-Yacu, 2 Oct 1972, *Croat 20857* (holotype, UC!).

Endemic. Epiphytic in wet forest, no elevation given, Ucayali.

The winged petiole, subulate scales, and white lamina patches distinguish this species.

Thus far known only from the type.

3. *Elaphoglossum amazonicum* Atehortua ex Mickel, *sp. nov.*

Ab affinibus rhizomate crasso, rhizomatis paleis flexuosis, laminis sterilibus latioribus apice cuspidatis, sporisque spinulosis differt.

Stem compact, horizontal to erect, 1–2 cm in diameter, scales linear-lanceolate, fulvous, concolorous, to 15 mm long, lustrous, 0.5 mm broad, crispate to very flexuous toward the tip. **Phyllopodia** present, 1.5 cm long, dark brown, aerophores bilateral to the phyllopodium like a long strip, and visible even in dry specimens but totally covered with dense mass of scales. **Leaves** fasciculate, 45–95 cm long, 7.5–10 cm broad. **Petiole** of sterile leaf 2–10 cm long, conspicuously winged, stout, terete but abaxially deeply canaliculate, 0.4 mm in diameter, densely scaly, scales subulate, 0.8 mm long, fulvous to brown-ferrugineous toward the costa, also with minute, short, resinous, capitate, glandular trichomes on the petiole and costa. **Lamina** oblanceolate, chartaceous to subcoriaceous, apex acuminate to abruptly long-cuspidate, base attenuate. **Veins** 1–2 mm apart, at 45 degree angle to costa. **Hyathodes** lacking; costa prominent on the abaxial side and densely scaly. **Lamina scales** lacking (at least in dry specimens) except on the costa and margin, but lamina densely covered with appressed, yellow, branched, glandular trichomes, which are usually oriented toward the margin, margin hyaline, densely covered with 2–3 rows of fine, orange to yellow, subulate scales similar in size and shape to those that cover the costa, and mixed with erect, capitate, glandular trichomes. **Fertile leaf** shorter than the sterile but

with a longer petiole (3–8.5 cm long), lamina narrowly lanceolate, 25–50 cm long, 2.3–4.0 cm broad, apex acuminate, base attenuate, the petiole becoming winged proximally; intersporangial scales lacking. **Spores** 25.4–31.5 μm long with narrow, short, spiculate ridges.

TYPE—Peru, San Martín, Zepelacio, near Moyobamba, Oct–Nov 1933, *Klug 3330* (holotype, US!; isotypes, BM!, MO!, NY!).

This species is very closely related to *E. ray-waense* and *E. latum* (Mickel) Atehortua ex Mickel, *comb. nov.* (*E. apodum* (Kaulf.) Smith var. *latum* Mickel, Amer. Fern J. 69: 100. 1979), but differs in the flexuous scales, large size, cuspidate lamina apex, stout, fibrous petiole, and finely spinulose spores.

Underwood annotated specimens of this species (e.g., *R. S. Williams 1027*, NY) as a new species of *Elaphoglossum*, using the epithet *williamsii*, but did not publish the name. There is now an *E. williamsii* Vareschi (in sect. *Elaphoglossum*, subsect. *Pachyglossa*), so another epithet was needed.

San Martín: Prope Tarapoto, in monte Campana, Peruvia orientalis, *Spruce 4639* (BM). **Junín:** Jauja, Satipo, Monte Alto margen del río, *Ridoutt 11562* (US). **Cuzco:** Ccochayoc, *Bües 1737* (US).

4. *Elaphoglossum amphioxys* Mickel, *sp. nov.*

Rhizomate gracillimo squamis scleroticis nigris induto necnon lamina utrinque attenuata nuda inter affines singula.

Stem long-creeping, 1.5–2 mm in diameter, scales scattered, ovate to lanceolate, dull to lustrous, sclerotic, orange to black, ca. 1 mm long, subentire. **Phyllopodia** present. **Leaves** 1–3 cm apart, 18–31 cm long, 2.0–4.3 cm broad. **Petiole** about $\frac{1}{3}$ the sterile leaf length, glabrous. **Lamina** lanceolate to narrowly elliptic, chartaceous, apex long-acuminate, base attenuate. **Veins** obscure, free, 1 mm apart, at ca. 80 degree angle. **Hydathodes** lacking. **Lamina scales** lacking, but surface punctate with resinous dots or substellate trichomes. **Fertile leaves** equal to or slightly shorter than the sterile, petiole $\frac{1}{2}$ – $\frac{3}{5}$ the leaf length, lamina narrowly lanceolate; intersporangial scales lacking.

TYPE—Peru, Ucayali (as Loreto), Chacra de Cesar Vela SE of granja del Sr. Parrera (Aguaytía), Coronel Portillo, Padre Abad, *J. Schunke V. 5493b* (holotype, NY!).

Endemic. Epiphytic in wet forests, 295–800 m, Amazonas, Ucayali, Huánuco, Junín, Cuzco, Madre de Dios.

Elaphoglossum amphioxys is allied to *E. lingua* but is distinct by the slender lamina that is attenuate at both ends.

Amazonas: Chachapoyas, cerro Puma Urco, *Soukup 4089* (US). **Huánuco:** SW slope of Río Llullapichis watershed, *Dudley 13331* (US). **Junín:** Prov. Tarma, Tarma-La Merced road, *Skog et al. 5021* (US). **Cuzco:** Paucartambo, Cosñipata Valley, Río Tono, ridge on road N of Patria, *Wachter 168* (F, GH). **Madre de Dios:** Manú, Cerro de Pantiacolla, Río Palotoa, 10–15 km NNW of Shintuya, *Foster 10755* (F, GH).

5. *Elaphoglossum amplum* Mickel, *sp. nov.*

Rhizomate elongato repenti necnon lamina magna marginem versus squamulis minutis induta distinguenda.

Stem compact, horizontal, 2–5 mm in diameter, scales linear-lanceolate, lustrous, dark brown, 1–2 mm long, with short, patent teeth. **Phyllopodia** evident but hidden by scales. **Leaves** 0.5–1 cm apart, 55–86 cm long, 3.5–5.6 cm broad. **Petiole** about $\frac{1}{2}$ the sterile leaf length, scales linear, dark brown to tan, appressed to ascending, 2–3 mm long, with short, patent teeth, **lamina** narrowly elliptic, chartaceous, apex acuminate, base broadly cuneate. **Veins** evident, free, 1.5–2 mm apart, at ca. 80 degree angle. **Hydathodes** lacking. **Lamina scales** abaxially scattered, round-peltate, ciliate, margin with dense orange scales 0.5–1 mm long, costa scales appressed, tan, dentate, 0.5–2 mm long, adaxial surface punctate with minute stellate trichomidia. **Fertile leaves** longer than the sterile, petiole $\frac{3}{4}$ the fertile leaf length, lamina linear, 1.8–2.0 cm broad; intersporangial scales lacking.

TYPE—Peru, Cuzco, Quillabamba, Santa Teresa, Mandornilloc, 0.5 km W of La Playa, *Peyton & Peyton 1246* (holotype, GH!).

Endemic. Terrestrial in wet forests, 2390–2700 m, Huánuco, Pasco, Cuzco.

In the creeping stem and long leaves it superficially resembles *E. williamsiorum* but differs from that species in having dentate, recurved stem scales, marginal dentate lamina scales, and linear fertile lamina.

Huánuco: Muña, *Bryan 547a* (F). **Pasco:** Oxapampa, SW of Oxapampa on road to María Teresa & Llaupí, *Foster 7617* (F). **Cuzco:** Urubamba, Machu Picchu, 0.5

km N of union of Sayacmarca & Aobamba Rivers, *Peyton & Peyton 1460* (GH).

6. *Elaphoglossum angustius* Mickel, *sp. nov.*

Ab *E. tenuicula* stipite paleis nigris araneiformibus obsito laminaque majori diversa.

Stem short-creeping, 2–4 mm in diameter, scales linear, blackish maroon to castaneous with tortuous hair tip, ca. 3 mm long, subentire. **Phyllopodia** distinct. **Leaves** fasciculate, 15–46 cm long, 0.6–1.9 cm broad. **Petiole** $\frac{1}{6}$ – $\frac{1}{3}$ the sterile leaf length, scales 1–2 mm long, some ascending, these sparse, linear-lanceolate, dark, sparsely dentate, ca. 2 mm long, mostly stellate and appressed, also some dark, appressed and arachnoid. **Lamina** narrowly elliptic, apex acuminate to caudate, base cuneate. **Veins** obscure, free, ca. 1 mm apart, at 60–70 degree angle. **Hydathodes** lacking. Abaxial **lamina** scales stellate, scattered, those on adaxial surface often with slight body or surface glabrescent. **Fertile leaves** longer than the sterile, petiole $\frac{1}{2}$ – $\frac{2}{3}$ the fertile leaf length, lamina narrower than the sterile; intersporangial scales lacking.

TYPE—Peru, San Martín, Zepelacio, near Moyobamba, *Klug 3503* (holotype, NY!; isotypes, F!, GH!, K!).

Endemic. Epiphytic in wet forests, (100) 900–2300 m, Amazonas, San Martín, Loreto, Lima, Junín, Ucayali, Cuzco.

This is related to *E. tenuiculum* but differs in the larger leaves, petiole and abaxial costa often with black araneiform scales, and the scales of the adaxial lamina surface with a slight scale body, not strictly stellate trichomes. Occasionally the stellate trichomes are gland-based, as in *J. Schunke* 369 and *Saunders* 1247.

Amazonas: Mendoza, *Woytkowski 8141* (GH). **Loreto:** Gamitanacocha, *J. M. Schunke 14264* (US). Maynas, Gamitanacocha, Río Mazán, *J. M. Schunke 369* (F, GH, NY, UC). **Lima:** Canta, Huamantanga, 4 km on road to Huamantanga from Lima–Canta road, *Saunders 1247* (F). Canta, 1 km on same road, *Saunders 1238* (GH). **Junín:** Chanchamayo valley, *C. Schunke 1349* (F), 1453 (F). Chanchamayo, *C. Schunke* Aug. 1908 (F, GH). San Ramón, *Killip & Smith 24772* (NY). Ucayali (as Loreto); Río Aguaytía, *Croat 20904* (UC). Cuzco: Machu Picchu, road to ruins, *León 460* (F). Río Marcapato, 60 km above Quincemil, *Madison 1010*, in part (GH), 1010 (GH).

7. *Elaphoglossum atropunctatum* Mickel, *sp. nov.*

Ab *E. oculato* laminae facie abaxiali paleis appressis nigris obsita abstans.

Stem compact, horizontal, ca. 5 mm in diameter, scales linear-lanceolate, dull orange, with dark center, 4–7 mm long, dentate. **Phyllopodia** evident, often under scales. **Leaves** approximate, 18–30 cm long, 2.0–3.2 cm broad. **Petiole** $\frac{1}{4}$ – $\frac{2}{3}$ the sterile leaf length, with scales ovate-lanceolate, erose-denticulate, orange-tan scales, 3–5 mm long, and also some smaller, appressed scales with dark center. **Lamina** narrowly elliptic, coriaceous, apex obtuse, base broadly cuneate. **Veins** obscure, free, ca. 1 mm apart, at ca. 70 degree angle. **Hydathodes** lacking. **Lamina** scales abaxially ovate to lanceolate, black, with pale hair-teeth, 1 mm long, scattered to dense, with round peltate ones ca. 0.5 mm long between the larger ones, adaxially ovate to lanceolate, white, cilio-denticulate, 1–2 mm long. **Fertile leaves** unknown.

TYPE—Peru, Pasco, Oxapampa, 2–4 km N of Mallampampa, *D. Smith & Canne 5835* (holotype, MO!).

Endemic. Epiphytic or terrestrial on organic matter in wet forest, 2200–2400 m, Huánuco, Pasco, Junín.

This species is distinct from *E. engelii* by the erose-denticulate petiole scales, and from *E. muscosum* and *E. oculatum* in the dense, dark, appressed scales on the abaxial lamina surface.

Huánuco: Carpish, *Coronado 74* (US). **Pasco:** Oxapampa, 2–4 km N of Mallampampa, *D. Smith & Canne 5861* (MO). **Junín:** Prov. Tarma, Tarma-La Merced, *Skog et al. 5023* (US).

8. *Elaphoglossum atosquamatum* Mickel, *Brittonia* 39: 315. 1987. **TYPE:** Venezuela, Tachira, faldas debajo del Páramo de Tama, cerca de la frontera Colombo-Venezolana, *Steyermarck, Dunsterville & Dunsterville 98348-A* (holotype, NY!; isotype, MO!).

Stem long-creeping, ca. 2 mm in diameter, scales spreading, linear-lanceolate, blackish brown, very indurated, lustrous, 6–8 mm long, margin entire. **Phyllopodia** present. **Leaves** 0.5–1.5 cm distant, sterile ones 5–20.5 cm long, 1.0–1.3 cm wide. **Petiole** ($\frac{1}{5}$) $\frac{1}{3}$ – $\frac{1}{2}$ the sterile leaf length, scales sparse

to lacking (deciduous), spreading, lanceolate, dark brown, lustrous, 2–4 mm long, margin entire or with a few long hairlike processes. **Lamina** narrowly elliptic, coriaceous, apex acuminate, base narrowly cuneate, margin distinctly revolute. **Veins** mostly obscure, 1 mm apart, at 70–80 degree angle. **Hydathodes** lacking. Abaxial **lamina scales** scattered, linear-deltate, black to brown, lustrous, 0.5–2 mm long, often hastate, margin subentire or with long, hairlike processes and surface with orange stellate trichomidia, adaxial surface glabrous or with costal scales sparse, black, as on abaxial surface. **Fertile leaves** about equal to the sterile in size and shape, petiole $\frac{1}{3}$ – $\frac{1}{2}$ the fertile leaf length; lamina scales present only along the costa.

Terrestrial (epiphytic and epipetric in Venezuela) in wet forest, 3500–4000 m, San Martín, Ancash.

Venezuela; Colombia; Peru.

The slender, long-creeping stem with recurved, black scales and the narrowly elliptic lamina with scattered black scales along the costa distinguish this species.

San Martín: Mariscal Cáceres, NW corner of Río Abiseo Nat. Park, Chochos, *Young & Leon 4687* (USM). **Ancash:** Carhuaz, Huascarán Nat. Park, Quebrada Ishinca, *D. Smith & Buddensiek 11257* (F, HUT, NY).

9. *Elaphoglossum auricomum* (Kunze) Moore, Index fil. 7. 1857.

Acrostichum auricomum Kunze, Linnaea 9: 28. 1834. TYPE: Peru, Huánuco, Pampayacu, *Poeppig*, July 1829 (holotype, LZ, destroyed; isotype, P!; photo, US of P).

Acrostichum cladotrichum Sodiro, Sert. fl. ecuad. 1: 9. 1905. TYPE: Ecuador, Nanegal, *Sodiro*, Sept. 1901 (holotype?, P!; isotypes, B!, P!, US!).

Stem short-creeping, 3–5 mm in diameter, scales linear-lanceolate, orange, 4–7 mm long, margin with hairlike teeth. **Phyllopodia** inconspicuous. **Leaves** fasciculate, 19–27 cm long, 1.4–1.6 cm broad. **Petiole** nearly lacking, ca. 1 cm long, densely clothed with spreading, orange scales 4 mm long. **Lamina** narrowly elliptic, chartaceous, apex acuminate, base narrowly cuneate. **Veins** obscure, free, 1–2 mm apart, at 60–70 degree angle. **Hydathodes** lacking. **Lamina scales** orange, liberally distributed but not overlapping, linear, 1–4 mm long with long, hairlike teeth, the teeth at least half as long

as the scale, some scales reduced to nearly stellate trichomes. **Fertile leaves** slightly shorter than the sterile, petiole ca. $\frac{1}{3}$ the fertile leaf length, with a few stellate trichomes on the costa abaxially, lamina narrower than the sterile; intersporangial scales lacking.

Epiphytic in wet forests, 850 m, Huánuco.

Mexico to Costa Rica; Colombia to Bolivia; Hispaniola.

Huánuco (as San Martín): Tingo María, *Allard 21359* (US).

10. *Elaphoglossum bakeri* (Sodiro) Christ, Monogr. Elaphoglossum 132. 1899.

Acrostichum bakeri Sodiro, Recens. crypt. vasc. Quit. 77. 1883. SYNTYPES: Ecuador, Atacazo cerca de Canzacoto en la orilla del río Yamboya, *Sodiro*, (not located); Ecuador, mas abajo hasta en la zona tropical, *Sodiro* (not located).

Stem short-creeping, 4–12 mm in diameter, scales linear-lanceolate, light brown, lustrous, to 7 mm long. **Phyllopodia** lacking. **Leaves** fasciculate, 70–110 cm long, 8.0–12.8 cm broad. **Petiole** about $\frac{1}{3}$ the sterile leaf length, with scales abundant, widely spreading, subulate, brown, lustrous, sparsely serrulate. **Lamina** narrowly lanceolate, chartaceous, apex short cuspidate, base broadly cuneate to rounded. **Veins** evident, free, ca. 2 mm apart, at ca. 80 degree angle. **Hydathodes** distinct. **Lamina scales** castaneous, on costa abundant, widely spreading as on petiole, 2–4 mm long, on both surfaces and margin scattered, 1–2 mm long. **Fertile leaves** longer than the sterile, petiole ca. $\frac{2}{3}$ the fertile leaf length, lamina slightly narrower than the sterile, scales appressed on costa, and scattered among the sporangia.

Terrestrial in wet forest, 2000 m, Amazonas. Costa Rica; Ecuador; Peru.

Amazonas: Prov. Bagua, ca. 20 km E of La Peca, *Barbour 2815* (F, UC).

11. *Elaphoglossum barbatum* (Karsten) Hieron., Bot. Jahrb. Syst. 34: 553. 1904.

Acrostichum barbatum Karsten, Fl. Columb. 2: 155. t. 181. 1869. TYPE: Colombia, Bogotá, *Lindig 111* (not located).

Elaphoglossum lindbergii var. *truncatum* Rosenst., Repert. Spec. Nov. Regni Veg. 25: 63. 1928. TYPE: Bolivia, Hacienda Simaco sobre el camino a Tipuani, *Buchtien 5166* (isotype, US!).

Stem horizontal, compact, 8–16 mm in diameter, scales linear, lustrous, castaneous, 4–7 mm long, with irregular teeth near scale apex. **Phyllopodia** lacking. **Leaves** fasciculate, 35–54 cm long, 4.1–10.4 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{1}{2}$ the sterile leaf length, with scales spreading, blackish-maroon, ca. 5 mm long, and with abundant, erect, minute glands and appressed stellate trichomidia. **Lamina** lanceolate, chartaceous, apex acuminate to caudate, base truncate to subcordate. **Veins** barely evident, free, ca. 1 mm apart, at 70 degree angle. **Hydathodes** lacking. **Lamina scales** limited to costa, 4–5 mm long, and margin, 2–3 mm long, adaxially only on margin, both surfaces with stellate trichomidia. **Fertile leaves** slightly shorter than the sterile, the petiole ca. $\frac{1}{2}$ the fertile leaf length, the lamina nearly as broad as the sterile, base rounded to subtruncate; intersporangial scales lacking.

Epiphyte in wet forests, 2050–3250 m, Amazonas, San Martín, Huánuco, Cuzco.

Colombia; Ecuador; Peru.

Elaphoglossum barbatum is distinct from *E. erinaceum* by the truncate base and many trichomidia, even onto the upper petiole.

Amazonas: Bagua, E of La Peca, *Barbour 2757* (F). **San Martín:** Mariscal Cáceres, Río Abiseo Nat. Park, *Young 3394* (NY), *Young & Leon 5006* (USM). **Huánuco:** Huacachi, near Muña, *Macbride 4690* (F). **Cuzco:** Urubamba, Machu Picchu, *Vargas 16822* (GH), *Cook & Gilbert 849, 852* (US).

12. *Elaphoglossum blepharoglottis* Mickel, *sp. nov.*

Elaphoglossum erinaceo affinis, ab ea lamina anguste elliptica basi anguste cuneata, costa adaxialiter glabra, abaxialiter squamis subulatis nigris dense induta, margine squamis appressis 1–1.5 mm longis nigris ciliata, squamisque rhizomatis fusco-aurantiacis crispis diversa.

Stem compact, 6–10 mm in diameter, scales linear-lanceolate, orange-brown, crispate, entire, ca. 10 mm long. **Phyllopodia** indistinct. **Leaves** fasciculate, 46–68 cm long, 4.6–6.3 cm broad. **Petiole** ca. $\frac{1}{2}$ the sterile leaf length, scales black, subulate, 4–6 mm long, dense, patent. **Lamina** narrowly elliptic, chartaceous, apex acuminate, base attenuate. **Veins** evident, 1–1.5 mm apart, at ca. 75 degree angle. **Hydathodes** lacking. **Lamina scales**

limited to abaxial costa, black, subulate, spreading, 2–3 mm long, and margin, black, subulate, to 1 mm long. **Fertile leaves** much shorter than the sterile (30 cm long), petiole about $\frac{1}{2}$ the fertile leaf length, lamina similar in shape to the sterile but narrower (ca. 2.4 cm); intersporangial scales lacking.

TYPE—Peru, Huánuco, Muña, 23 May–4 June 1923, *Bryan 534* (holotype, F!).

Endemic. Epiphytic in dry woods, 2150 m, Huánuco.

Elaphoglossum blepharoglottis is in the *E. erinaceum* complex, with dark subulate scales and no hydathodes, but is distinct in the dense scales of the petiole and abaxial costa.

Thus far known only from the type.

13. *Elaphoglossum camptolepis* Mickel, *sp. nov.*

Rhizomate longe repenti necnon lamina lanceolata squamis fuscis curvatis instructa inter affines determinanda.

Stem long-creeping, 1–1.5 mm in diameter, scales linear, lustrous, spreading, recurved, blackish-maroon, with short, sparse (often curved) teeth. **Phyllopodia** present, often indistinct or covered with scales. **Leaves** 1–3 cm apart, 6–12 cm long, 1.6–2.4 cm broad. **Petiole** about $\frac{1}{4}$ the sterile leaf length, with scales linear, blackish maroon, lustrous, spreading and recurved, sparsely serrulate, 1–2 mm long. **Lamina** lanceolate, chartaceous, apex acute to acuminate, base rounded. **Veins** indistinct, free, 1–2 mm apart, at ca. 70 degree angle. **Hydathodes** present but inconspicuous, as a pit, but not dark. **Lamina scales** on both surfaces as on petiole, strongly curved, serrulate, more concentrated on costa, straighter and longer on upper surface, 1–2 mm long abaxially, 2–3 mm long adaxially, abaxial surface also with resinous dots. **Fertile leaves** not seen.

TYPE—Peru, San Martín, Mariscal Cáceres, Río Abiseo Nat. Park, Puerta del Monte, *Young 1913* (holotype, NY!; isotype, USM!).

Endemic. Terrestrial(?), above timberline, 3500 m, San Martín.

Thus far known only from the type.

14. *Elaphoglossum cardenasii* Wagner, Bull. Torrey Bot. Club 81: 62. 1954. TYPE: Bolivia,

Dept. Cochabamba, Prov. Chapare, about Km. 120 Cochabamba to Chimore, *Cardenas 795* (holotype, GH!).

Stem short-creeping, 4–10 mm in diameter, scales flat, appressed, ovate-acuminate, dull brown, 2–3 mm long, entire. **Phyllopodia** lacking. **Leaves** approximate, 33–39 cm long. **Petiole** $\frac{1}{2}$ – $\frac{2}{3}$ the sterile leaf length, with scales light brown, appressed, 1–2 mm long, overlapping in lower part, scattered distally. **Lamina** pedately lobed, 14–20 cm broad, chartaceous, apex acuminate, 2–3 times basally divided lateral lobe at base of each side of lamina; margin slightly undulate, shallowly crenulate. **Veins** evident, free, 1–2 mm apart, at ca. 40–60 degree angle. **Hydathodes** evident. **Lamina scales** deltaxially, 0.2–0.5 mm long, abaxially consisting of squamules to stellate trichomidia, costal scales lanceolate, 0.5–1 mm long. **Fertile leaves** shorter than the sterile, petiole $\frac{1}{5}$ – $\frac{2}{10}$ the fertile leaf length, the lamina similar in architecture but smaller than the sterile lamina, 4–8 cm long, 5–10 mm broad; intersporangial scales lacking.

Epiphytic in wet forests, ca. 3050 m, Cuzco. Peru; Bolivia.

This is the best known of the dissected forms of *Elaphoglossum* (excluding *Peltapteris*). It is apparently fixed genetically as it is found in several localities. Other kinds of dissection (creeping, cruciform) are found in several species, but not with any consistency. A pedate leaf has been found in *E. simulans*, which see. I have not seen the Peruvian specimen, and conceivably it is a misidentified specimen of *E. simulans*.

Cuzco: Alturas de Sicre, *Bües* (Cuz).

15. *Elaphoglossum castaneum* (Baker) Diels, Nat. Pflanzenfam. 1(4): 333. 1899.

Acrostichum castaneum Baker, J. Linn. Soc. Bot. 15: 166. 1877. TYPE: Ecuador in sylv. vulc. Corazón, a Bango, *Sodi*, Aug 1873 (holotype, k; isotypes, b!, sl!, us!).

Stem moderately creeping, 3–5 mm in diameter, scales brown to black, linear-lanceolate, lustrous, ca. 2 mm long, older parts of stem often with scattered, arched scales less than 1 mm long. **Phyllopodia** lacking. **Leaves** slightly apart, 27–55 cm long, 3.0–7.8 cm broad. **Petiole** $\frac{1}{5}$ – $\frac{2}{3}$ the sterile leaf length, glabrous except at base. **Lamina** lan-

ceolate to elliptic or ovate-lanceolate, chartaceous, apex acuminate, base cuneate to subtruncate. **Veins** inconspicuous, free, ca. 1 mm apart, at 70–80 degree angle. **Hydathodes** conspicuous. **Lamina scales** on both surfaces sparse, 0.5–1 mm long, awl-shaped, dark, lustrous. **Fertile leaves** longer than the sterile, petiole $\frac{1}{5}$ the fertile leaf length, lamina narrowly lanceolate; intersporangial scales lacking.

Terrestrial in wet forests, (750–)1950–3300 m, San Martín, Huánuco, Pasco, Cuzco.

Costa Rica; Panama; Colombia; Ecuador; Peru; Bolivia.

San Martín: Mariscal Cáceres, NW corner of Río Abiseo Nat. Park, Puerta de Monte, *Young & León 4463* (USM). **Huánuco:** Tambo de Vaca, *Macbride 4451* (F, US). **Pasco:** Prov. Oxapampa, Oxapampa, *van der Werff 8610* (UC). Prov. Oxapampa, San Alberto, *van der Werff 8430* (UC) Oxapampa, Río San Alberto, Abra Esperanza, *Foster & d'Achille 10294* (F, GH). **Cuzco:** Paucartambo, at Km 142 on Paucartambo–Manú road, Manú Nat. Park, *Skog & Skog 5203* (NY, US).

16. *Elaphoglossum chloödes* Mickel, *sp. nov.*

Lamina lineari abaxialiter squamis aurantiacis intertextis indua recognoscenda.

Stem short-creeping, 2–3 mm in diameter, scales linear-lanceolate, lustrous, brown, ca. 3 mm long, entire. **Phyllopodia** distinct. **Leaves** 1–2 mm apart, 30–45 cm long, 0.8–1.0 cm broad. **Petiole** $\frac{1}{4}$ – $\frac{1}{3}$ the sterile leaf length, with dark brown, linear, lustrous, entire scales, at petiole base ascending, 2–3 mm long, distally appressed, tan, 0.5–1 mm long, entire. **Lamina** linear, chartaceous, apex acuminate, base attenuate. **Veins** evident, free, 1 mm apart, at ca. 70 degree angle. **Hydathodes** lacking. **Lamina scales** abaxially matted, white, peltate, round, dentate, ca. 0.5 mm across, membranous, most delicate in the genus, costal scales scattered, dark or tan, appressed as on petiole, adaxially scattered, white, flaky, ovate, entire, especially near margin. **Fertile leaves** unknown.

TYPE—Peru, Ayacucho, Ccarrapa, between Huanta & Río Apurímac, *Killip & Smith 22391* (holotype, NY!; isotype, US!).

Endemic. On moist banks and rotten logs in wet forests, 1500–2380 m, Amazonas, Ayacucho, Cuzco.

This forms a complex with *E. eatonianum* (E.

G. Britt.) C. Chr., of Ecuador, and *E. vittarioides*, all having a linear leaf, linear, lustrous brown stem scales, and dark-streaked costal scales.

Amazonas: Bongará, 4 km N of Pomacochas on road to Rioja, Knapp *et al.* 7487 (MO). **Cuzco:** Quillabamba, Santa Teresa, 0.5 km W of La Playa, Peyton & Peyton 1149 (GH).

17. *Elaphoglossum ciliatum* (Presl) Moore, Index fil. 8: 353. 1857, based on *Olfersia ciliata* Presl.

Acrostichum ciliatum Presl, Reliq. haenk. 1: 15. 1825, not. Desv. 1811. TYPE: Peru, ad Huánuco, Haenke s.n. (holotype, PR or PRC).

Olfersia ciliata Presl, Tent. Pterid. 234. 1836, nom. nov. (Art. 72) for *A. ciliatum* Presl, not Desv.

Acrostichum preslianum Fée, Mém. foug. 2: 46. 1845, nom. nov. for *Acrostichum ciliatum* Presl, not Desv.

Elaphoglossum preslianum (Fée) Christ, Monogr. Elaphoglossum 95. 1899.

Stem long-creeping, ca. 2–3 mm in diameter, glutinous, scales lacking except for a few resinous brown ones 1 mm long. **Phyllopodia** 2–4 cm long. **Leaves** fasciculate, 1–10 mm apart, 26–78 cm long, 1.2–2.3 cm broad. **Petiole** $\frac{1}{2}$ the sterile leaf length, with sparse brown scales, these widely spreading, 1 mm long, entire. **Lamina** linear-elliptic, chartaceous to subcoriaceous, apex acute to acuminate, base cuneate. **Veins** obscure, free, 1 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina** scales on petiole: sparse, small, brown, entire, ovate, on abaxial costa and margin, often glandular-punctate below. **Fertile leaf** longer than the sterile, petiole $\frac{3}{8}$ the leaf length, the lamina linear, 6–8 mm wide; intersporangial scales lacking.

Epiphytic and terrestrial in wet forests, 400–2650 m, Huánuco, Junín, Pasco, Ucayali, Cuzco.

Huánuco: Carpish Divide, C. Landeman 5157 (K). Leoncio Prado, La Divisoria, Plantación Azul, Ridoutt, 3 Aug. 1942 (USM). Cushi, Macbride 4812 (F, US). Muña, Bryan 532 (F, US). **Pasco:** Prov. Oxapampa, Abra los Mellizos, Skog *et al.* 5042 (US). **Junín:** Tarma, Chanchamayo, Esposto 686 (GH). Pichis Trail, Eneñas, Killip & Smith 25668 (NY, US). Chanchamayo Valley, C. Schunke 136 (F, US). Schunke Hacienda, above San Ramón, C. Schunke A 145 (US). Tarma, Agua Dulce, Woytkowski 35494 (UC). Utcuyacu, Woytkowski 494 (US). **Ucayali** (as Loreto): Coronel Portillo, cerca a la Divisoria, Ridoutt (USM: 12470), 3 Aug. 1942 (GH). **Cuzco:** Paucartambo, Sta. Isabel, Kosñipata, C. Vargas 23014 (GH).

18. *Elaphoglossum concinnum* Mickel, *sp. nov.*

Ab *E. squamipedi* frondibus minoribus, lamina squamis obscurioribus vestitis distat.

Stem long-creeping, 0.5–0.8 mm in diameter, scales linear-lanceolate, orange-tan, ca. 3 mm long, entire. **Phyllopodia** lacking. **Leaves** 1–5 mm apart, 1.3–2.6 (3.5) cm long, 0.5–0.9 cm broad. **Petiole** $\frac{2}{5}$ – $\frac{3}{5}$ the sterile leaf length, with tan scales widely spreading, 1–2 mm long, entire. **Lamina** ovate and suborbicular to oblanceolate, subcoriaceous, apex obtuse, base narrowly to broadly cuneate. **Veins** obscure, free, 1 mm apart, at 60–70 degree angle. **Hydathodes** lacking. **Lamina scales** dark brown to black, sclerotic, scattered, especially abaxially, linear-deltate, subentire, with sparse irregular teeth, adaxial ones fewer, paler. **Fertile leaves** longer than the sterile, petiole $\frac{1}{2}$ the leaf length, lamina ovate-deltate to suborbicular; intersporangial scales black, sclerotic.

TYPE—Peru, San Martín, Mariscal Cáceres, Río Abiseo Nat. Park, near Las Papayas ruins, Young 1301 (holotype, NY!).

Endemic. Epiphytic in wet forests, 2600–3750 m, Amazonas, San Martín.

Amazonas: Prov. Bongará, 2–4 km WSW of Pomacocha, Wurdack 874 (US). **San Martín:** Mariscal Cáceres, trail between La Playa camp & Papayas camp, Río Abiseo Nat. Park, Young & León 4960 (USM).

19. *Elaphoglossum craspedotum* Copel., Univ. Calif. Publ. Bot. 19: 303. t. 63. 1941. TYPE: Peru, Huánuco, Dist. Churubamba, Hacienda Mercedes, Mexia 8177 (holotype, UC!; isotypes, F!, GH!, US!).

Stem compact, horizontal, ca. 8 mm in diameter, scales linear-lanceolate, lustrous, dark red-brown, 4–6 mm long, entire. **Phyllopodia** evident, ca. 4 cm long. **Leaves** fasciculate, 60–75 cm long, 3.4–4.6 cm broad. **Petiole** $\frac{1}{2}$ the sterile leaf length, with tan to orange scales appressed to spreading, 1–2 mm long, with very thin, sparse hair-teeth. **Lamina** narrowly elliptic, chartaceous, apex acuminate, base attenuate. **Veins** evident, free, ca. 1 mm apart, at 70–80 degree angle. **Hydathodes** lacking. **Lamina scales** adaxially white, substellate, scattered, ca. 0.2–0.5 mm long, abaxial laminar surface punctate, glandular, costal scales pale, nearly round, ciliate, 0.5 mm long. **Fertile leaf**

shorter than the sterile, petiole $\frac{3}{5}$ the fertile leaf length, the lamina linear, 10–13 mm broad; intersporangial scales lacking.

Endemic. Epiphytic in wet forest, 1200 m, Huánuco.

Thus far known only from the type.

20. **Elaphoglossum cuspidatum** (Willd.) Moore,
Index fil. xvi. 1857.

Acrostichum cuspidatum Willd., Sp. pl. ed. 4, 5: 106. 1810. TYPE: Venezuela, Caracas, *Bredemeyer* (holotype, b!, *Herb. Willd.* 19516).

Stem short-creeping, ca. 4–8 mm in diameter, scales linear-lanceolate, lustrous, black-brown, 2–3 mm long, entire. **Phyllopodia** distinct. **Leaves** 1–10 mm apart, 28–75 cm long, 1.9–4.6 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{1}{2}$ the sterile leaf length, with ovate to lanceolate scales, these black with white, ciliate margin, appressed, 1–3 mm long. **Lamina** narrowly elliptic, chartaceous, apex cuspidate (to acuminate), base broadly to narrowly cuneate. **Veins** obscure, free, 1 mm apart, at ca. 80 degree angle. **Hydathodes** lacking. **Lamina scales** orange, abaxially consisting of a felt-like mass of round, peltate ciliate scales 0.5 mm long and ovate-lanceolate scales 1 mm long, the larger ones with maroon center, costal scales ovate to ovate-lanceolate, red-black with pale ciliate margin as on petiole, lamina adaxially glabrous or with scales scattered to dense, round, peltate, ciliate, pale, ca. 0.7 mm in diameter. **Fertile leaves** shorter than the sterile, petiole $\frac{2}{3}$ the fertile leaf length, the lamina slightly narrower than the sterile; intersporangial scales lacking.

Epiphytic, rarely terrestrial in wet forests, (600) 1200–3800 m, Piura to Amazonas, south to Cuzco.

Costa Rica; Venezuela to Bolivia.

Piura: Huancabamba, Loma redonda (Sapalache-Chinjuela), *Sagástegui* 10193 (NY, HUT, UC), Ayabaca, *Soukup* 4315 (US). **Cajamarca:** Chota, La Palma-Dist. Conchán, *A. Diaz & Laos* 5730 (USM). Chota, Chota-Tacabamba road, *D. Smith & Vásquez M.* 3556 (UC). **Amazonas:** Bongará, 3 km S Pomacocha, *Wurdack* 1002 (F, GH, NY). NW of Jumbilla, *Soukup* 5245 (GH). **La Libertad:** Otuzco, Huaranchal, *Sagástegui* 0203 (GH). **San Martín:** Lamas, Alonso de Alverado, San Juan de Pacayzapa, *J. Schunke V.* 5891 (F). Palo Blanco, *J. Schunke V.* 5673 (F). Zepelacio, near Moyobamba, *Klug*

3503a (US). **Ancash:** Yungay, Quebrada Llanganuco, *Perez* 99 (USM). **Pasco:** Oxapampa, *Soukup* 3355 (F, GH, US). Oxapampa, near Villa Rica, Chacra del Sr. Simon Espilco, *van der Werff et al.* 8317 (MO). **Junin:** Chanchamayo Valley, *C. Schunke* 173 (F). Tarma, Cumbre Yacunay ridge above La Merced, *Hutchinson* 1978 (F, GH, UC, US). Tarma, Agua Dulce, *Woytkowski* 35498 (UC). **Ucayali** (as Loreto): Coronel Portillo, La Divisoria, *Ferreira* 1049 (GH). **Cuzco:** Prov. La Convención, Quellohuno-Chirumbia, *C. Vargas* 11377 (GH). La Convención, NE from Hacienda Luisiana & Apurímac River (Cordillera Vilcabamba), *Dudley* 11147 (GH). Urubamba, Machu Picchu, *Saunders* 462A (F). Los Palmitos, Cabecero Río Karibeni, *Bües* 1959 (US).

21. **Elaphoglossum decoratum** (Kunze) Moore,
Index. fil. 8. 1857.

Acrostichum decoratum Kunze, *Linnaea* 9: 25. 1835. TYPE: Peru, Huánuco, Pampayaco (Pampayacu), *Poeppig* *Diar.* 1134, July 1829 (holotype, LZ, destroyed; isotype, MO!).

Stem short-creeping, to 6 mm in diameter, scales linear, orange, crispate, to 16 mm long, entire or with very sparse, small, irregular teeth. **Phyllopodia** lacking. **Leaves** fasciculate, to 70 cm long, 12 cm broad. **Petiole** $\frac{1}{4}$ – $\frac{1}{3}$ the sterile leaf length, scales orange, ovate, spreading, with obtuse tip, to 10 mm long. **Lamina** elliptic, apex cuspidate, base broadly cuneate; texture thin. **Veins** evident, free (with rare anastomoses), ca. 2 mm apart, at ca. 70 degree angle. **Hydathodes** lacking. **Lamina scales** limited to the costa and margin, forming a continuous band of overlapping, cordate, golden scales on the margin, elliptic on the costa. **Fertile leaves** rare, shorter than the sterile ones, margins lacking scales; intersporangial scales lacking.

Epiphytic in wet forests, 800–1500 m, Huánuco, Cuzco.

Guatemala; Costa Rica; Panama; West Indies; Colombia and Venezuela to Bolivia.

Huánuco: Río Lllullapichis watershed, Cerros del Sira, *Dudley* 13008 (GH). Sira mountains, *Seidenschwarz* 442/1 (US, GH). **Cuzco:** Paucartambo, Cosñipata Valley, Río Tono, *Wachter* 132 (F).

22. **Elaphoglossum dichroum** Mickel, *sp. nov.*

Stipitis costaeque squamis dentatis bicoloribus, squamisque dentatis laminae marginem versus congestis praestans.

Stem compact, 5 mm in diameter, scales linear, dull, tan with blackish streaks, ca. 10 mm long, entire. **Phyllopodia** present. **Leaves** approximate, 65–70 cm long, 5.5–6.0 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{2}{5}$ the sterile leaf length, scales black-centered with white margin, larger ones ovate-lanceolate, 2–6 mm long, slightly spreading, smaller ones 1 mm long, appressed. **Lamina** narrowly elliptic, subcoriaceous, apex acute, base truncate. **Veins** evident, 1 mm apart, at 75 degree angle. **Hydathodes** lacking. **Lamina surface** adaxially glabrescent, with concentration of 1 mm hair-toothed scales at margin, abaxially glabrous, indistinctly gland-dotted, or with scattered stellate trichomes, the scales reduced to 1–3 rays, costal scales 1–2 mm long, erose-denticulate, black-centered with white margin. **Fertile leaves** shorter than the sterile, petiole $\frac{3}{5}$ the leaf length, lamina linear, 1 cm broad; intersporangial scales abundant, ciliate.

TYPE—Peru, San Martín, Mariscal Cáceres, Parque Nac. Río Abiseo, Puerta del Monte, León & Young 1510 (holotype, USM!).

Endemic. Epiphytic in wet forests, elevation unknown, San Martín.

This species is closely allied to *E. oculatum*, as evidenced by the marginal concentration of scales, ciliate intersporangial scales, bicolourous petiole and costal scales, the nearly naked lamina surfaces with scales reduced to stellate trichomes, but it is much larger, the apex is acute rather than obtuse, and the fertile lamina is linear and shorter than the sterile.

Thus far known only from the type.

23. *Elaphoglossum discolor* (Kuhn) C. Chr., Index fil. 306. 1905.

Acrostichum discolor Kuhn, Linnaea 36: 53. 1869. **SYNTYPES**: Brazil, San Gabriel ad Rio Negro, Spruce 2309, 2245; Brazil, Panure, Spruce 2869 (none located, all B?).

Stem compact, horizontal, ca. 3–4 mm in diameter, scales linear-lanceolate, reddish-orange, ca. 3 mm long, with irregular weak teeth. **Phyllopodia** evident. **Leaves** fasciculate, ca. 30 cm long, 4.0–4.5 cm broad. **Petiole** $\frac{1}{2}$ the leaf length, with orange to blackish, lanceolate to linear scales to trichomidia, scales ascending, 2–3 mm long, with irregular teeth. **Lamina** elliptic, chartaceous, apex acuminate, base cuneate and abruptly decurrent. **Veins** evident, free, 1 mm apart, at ca. 80 degree angle. **Hydathodes** lacking. **Lamina scales** linear

with long, sparse teeth on both sides of lamina, 1–1.5 mm long. **Fertile leaves** shorter than the sterile, petiole $\frac{3}{5}$ the fertile leaf length, the lamina narrowly elliptic, 2 cm broad, acute; intersporangial scales lacking.

Epiphytic and terrestrial, low forest on white sand and wet forests, 150–980 m, San Martín, Loreto, Pasco, Junín.

Venezuela; Colombia; Ecuador; Peru; Brazil.

Elaphoglossum discolor can be distinguished by the short stem, its scales linear and reddish-orange with irregular processes, the petiole scales scattered, lamina scales scattered, linear, flexuous, dissected, and the fertile leaf longer than the sterile.

San Martín: Rioja, near Rioja and Naranjos, Knapp et al. 7444 (UC). **Loreto**: Maynas, Iquitos, Carretera de Varillal km 6 de Quisto Cocha al caserio de Varillal, Rimachi Y. 7844 (NY). Prov. Maynas, Distr. Iquitos, Puerto Almendras, van der Werff et al. 9788, 9819, 9820 (UC). Prov. Requena, Jenaro Herrera, van der Werff et al. 10001 (UC). Vicinity of Iquitos, Revilla 3758 (NY), 4322 (UC). **Pasco**: Oxapampa, Palcazú valley, D. Smith 3852 (UC). **Junín**: East of Quimiri Bridge near La Merced, Killip & Smith 23850 (US).

24. *Elaphoglossum diversifrons* C. Chr., Index fil. Suppl. 1: 42. 1913.

Acrostichum diversifolium Sodiro, Sert. fl. ecua. II. 32. 1908, not Blume, 1828. **SYNTYPES**: Ecuador, in silvis suband. vulc. Corazón Sodiro; Atacatzo, Sodiro (P!, S!); “itemque in loc. praeruptis opacis prope Quito,” Sodiro (P!).

Stem short-creeping, 1.5–2 mm in diameter, scales linear, lustrous, castaneous, 3–4 mm long, denticulate. **Phyllopodia** lacking. **Leaves** approximate, 15–24 cm long, 2.0–2.4 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{1}{2}$ the sterile leaf length, scales castaneous, lustrous, subulate, patent, denticulate, 1–2 mm long. **Lamina** elliptic, chartaceous, apex acuminate, base broadly cuneate to rounded. **Veins** evident, 2–2.5 mm apart, at ca. 60-degree angle. **Hydathodes** present. **Lamina scales** evenly scattered on both surfaces, subulate, castaneous, 1–2 mm long. **Fertile leaves** slightly longer than the sterile, petiole about $\frac{3}{4}$ the leaf length, lamina lanceolate; intersporangial scales lacking.

Epiphytic in wet forests, 2700 m, Huancavelica. Ecuador; Peru.

Huancavelica: Tayacaja, Marcavalle, Tovar 4756 (GH).

25. *Elaphoglossum elegantipes* Mickel, *sp. nov.*

Rhizomatis squamae fuscae cum stipite gracile notulas diagnosticas proferunt.

Stem compact, horizontal, 3–4 mm in diameter, scales linear-lanceolate, dull dark brown, 3–5 mm long, with hairlike processes. **Phyllopodia** present. **Leaves** fasciculate, 24–42 cm long, 2.7–4.8 cm broad. **Petiole** $\frac{1}{4}$ – $\frac{1}{3}$ the sterile leaf length, glabrous. **Lamina** elliptic, chartaceous, apex long-acuminate, base attenuate. **Veins** evident, free, 1 mm apart, at 70–80 degree angle. **Hydathodes** lacking. **Lamina indument** lacking abaxially, but occasionally some minute, orange, stellate trichomidia adaxially. **Fertile leaves** longer or slightly shorter than the sterile, petiole $\frac{3}{5}$ – $\frac{2}{3}$ the fertile leaf length, lamina slender, 1.4–2.0 cm broad; intersporangial scales lacking.

TYPE—Peru, Cuzco, Paucartambo, Cosñipata Valley, Río Tono, N. of Patria, *Wachter 138* (holotype, F!; isotype, GH!),

Endemic. Epiphytic, rarely terrestrial, in wet forests, 300–2400 m, Amazonas, Huánuco, Pasco, Junín, Ucayali, Cuzco, Madre de Dios, Puno.

Amazonas: Bagua, ca. 20 km E of La Peca, *Barbour 2766* (UC). **Huánuco:** SW slope of Río Lullapichis watershed on ascent of Cerros del Sira, *Dudley 13134* (GH). **Carpish,** *Ellenberg 3931* (GH). **Pasco:** Oxapampa, Palcazú valley, between Iscozacín & Villa America, *D. Smith 3852* (MO). Oxapampa, Gran Pajonal, 2–3 km N of Chequitavo, *D. Smith 5087* (MO, UC). Oxapampa, 4–5 km N of Mallampampa, *D. Smith & Canne 5795* (MO). 2–4 km N of Mallampampa, *D. Smith & Canne 5862* (MO). Oxapampa, Palcazú, Río Alto Iscozacín, Ozuz, *Foster 9950* (F). Chontabamba, Abra “La Suiza”, camino al Río Chontabamba, *León et al. 979* (F). **Junín:** La Merced-Chanchamayo, *Soukup 1104* (F). Satipo, Pichanaki, *León 229* (USM). Chanchamayo Valley, *C. Schunke 174* (F). **Ucayali** (as Loreto): Coronel Portillo, Chacra de Cesar Vela, *J. Schunke V. 5493* (F). **Cuzco:** Paucartambo, Cosñipata Valley, Río Tono, N of Patria, *Wachter 169* (F, GH). **Madre de Dios:** Manú, Cerro de Pantiacolla, Río Palotoa, 10–15 km NNW of Shintuya, *Foster 10752* (F). **Puno:** La Pampa, Río Tavera, *Watkins* in 1916 (us).

26. *Elaphoglossum engelii* (Karsten) Christ, Monogr. Elaphoglossum 81. 1899. *Acrostichum engelii* Karsten, Fl. Columb. 1: 118, t. 59. 1860. **TYPE:** Colombia, cordillera Meridensis, *Karsten* (holotype, B?).

Stem compact, horizontal, 5–8 mm in diameter, scales linear, lustrous, maroon, 8–15 mm long, entire to irregularly hair-toothed. **Phyllopodia** present but hidden by scales. **Leaves** fasciculate, 17–47 cm long, 1.4–2.7 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{1}{2}$

the sterile leaf length, scales orange, appressed, 3–7 mm long, ciliate. **Lamina** narrowly elliptic, coriaceous, apex obtuse, base broadly cuneate to rounded. **Veins** obscure, free, 1 mm apart, at ca. 70 degree angle. **Hydathodes** lacking. **Lamina scales** abaxially lanceolate, orange, ciliate, 2–3 mm long, dense to loose, costal scales broader, ovate-lanceolate, orange to dark centered, 3–4 mm long, adaxially same as below. **Fertile leaves** longer than the sterile, petiole $\frac{2}{3}$ the fertile leaf length, lamina narrower than the sterile; intersporangial scales lacking (costal scales ovate-lanceolate, ciliate, darker center plus small round ciliate ones).

Terrestrial, epipetric, and epiphytic, in ericaceous heath, shrubby grassland, puna, rocky roadbanks, talus slopes, elfin forest, and cloud forests, (1800–)2800–4600 m, Piura to Amazonas, southward to Ayacucho and Puno.

Elaphoglossum engelii is in the *E. muscosum* group, differing from others in that complex by the petiole scales being long-ciliate rather than erose-denticulate. A name sometimes used for this species is *E. denticulatum* Ruiz & Pavón. I have not found the reference or description (the epithet would be under *Acrostichum*), but if it does apply, it would have priority.

Piura: Huancabamba, above Canchaque on road to Huancabamba, *Hutchinson 1651* (UC). **Lambayeque:** Ferreñafe, ca. 7 km NW of Incahuasi, *Dillon & Skillman 4116* (F, GH). Ferreñafe, Incahuasi, Laguna Temblaminara, *Sagástegui 12780* (UC). **Cajamarca:** Cajabamba, Cajabamba-Luchubamba, *Sagástegui 11200* (GH, NY). **Amazonas:** Chachapoyas, Cerros Calla Calla, above Leimbamba on road to Balsas, *Hutchinson & Wright 5567* (F, GH, NY, UC, US). Entre donila y Cohechan, *Soukup 4133* (F). **La Libertad:** Sanchez, Carrion, road from Trujillo to Huamachuco, *Dimmitt 1135* (NY). **San Martín:** Mariscal Cáceres, Río Abiseo Nat. Park, *Young & Watson 3508* (NY). **Ancash:** Huari, Huascarán Nat. Park, *D. Smith et al. 12382* (F, NY). Yungay, Quebrada de Llanganuco, *Perez 85* (USM). **Huánuco:** Mito, *Bryan 370* (F). Huánuco, Carpish, *Coronado 74* (GH, UC). **Junín:** Chanchamayo, Mina Pichita, above San Ramón, *van der Werff et al. 8658* (MO, UC). **Ayacucho:** Pampalca between Huanta & Río Apurímac, *Killip & Smith 23283* (NY, US). **Apurímac:** 5 km N of Huancarama, *West 3801* (UC). **Cuzco:** Urubamba, Machu Picchu, in Lactapampa on Aobamba River, *Peyton & Peyton 815* (GH, MO). Pilla-huata, Cerro de Cusilluyoc, *Pennell 14125* (GH, NY, US). **Puno:** Sandia, S of Limbani, *Metcalfe 30453* (GH), also *Ruiz 4570* (53 crossed out) (us ex Herb. Lambertii).

27. *Elaphoglossum ensiforme* Mickel, *sp. nov.*

Ab *E. lloensi* squamis stipitis laminaeque pallidis et lamina graciliori apicem versus gradatim attenuata distat.

Stem long-creeping, 1–1.5 mm in diameter, scales linear-lanceolate, dull tan, 3–5 mm long, entire. **Phyllopodia** lacking. **Leaves** fasciculate, (9–)21–26 cm long, 1.4–2.0 cm broad. **Petiole** $\frac{2}{3}$ – $\frac{3}{5}$ the sterile leaf length, with orange scales appressed to ascending, 3–4 mm long, subentire with occasional irregular teeth. **Lamina** narrowly elliptic, chartaceous, apex acuminate, base narrowly cuneate. **Veins** evident, free, 1–1.3 mm apart, at ca. 60 degree angle. **Hydathodes** lacking. **Lamina scales** scattered, linear-deltate, tan, 1–2 mm long, hastate abaxially, sparse adaxially. **Fertile leaves** not known.

TYPE—Peru, Cuzco, Urubamba, Machu Picchu, in Llactapampa, a small pampa below Palcay on the Aobamba River, *Peyton & Peyton 814* (holotype, MO!).

Endemic. Epiphytic in wet forests, 3300 m, Cuzco.

Elaphoglossum lloense (Hooker) Moore (Venezuela, Colombia, Ecuador) has lamina proportionally broader, with more caudate apex, lamina scales darker, and petiole scales with black base.

Cuzco: Urubamba, Machu Picchu, in Llactapampa, a small pampa below Palcay on the Aobamba River, *Peyton & Peyton 811* (MO).

28. *Elaphoglossum erinaceum* (Fée) Moore. Index fil. 9. 1857. **Figure 25c.**

Acrostichum erinaceum Fée, Mém. foug. 2: 41. 1845. **SYNTYPES:** Guadeloupe, rivière de Saint-Louis, de Thiouville (P!); Brazil, *Gaudichaud*; Mexico, *Karwinsky*, in 1827.

Elaphoglossum erinaceum var. *boliviensis* Rosenst., Repert. Spec. Nov. Regni Veg. 12: 476. 1913. **TYPE:** Bolivia, Polo-Polo bei Coroico, Nordyungas, *Buchtien 3470* (isotype, US!).

Stem short creeping, 10–20 mm in diameter, scales linear, castaneous to orange, to 17 mm long, plane to crispate, entire or with very irregular teeth near the tip. **Phyllopodia** lacking. **Leaves** fasciculate, 30–52 cm long, 3.7–9.2 cm broad. **Petiole** $\frac{1}{2}$ – $\frac{1}{2}$ the sterile leaf length, scales dark reddish brown, subulate, widely spreading, to 5 mm long, also with minute erect glandular trichomes on petiole and midvein. **Lamina** lanceolate to elliptic, apex acuminate to caudate, base rounded (rarely cuneate). **Veins** evident, free, 1–1.5 mm apart, at 70–80-degree angle. **Hydathodes** lacking. **Lamina scales** subulate, dark reddish brown, often ap-

pearing black, mostly on the midvein and spreading from the margin, also with minute, simple, branched, or stellate trichomidia on the abaxial surface. **Fertile leaves** slightly shorter than the sterile, petiole $\frac{1}{3}$ – $\frac{1}{2}$ the fertile leaf length, lamina narrowly elliptic, with scattered dark subulate scales on the abaxial costa, intersporangial scales lacking.

Epiphytic, rarely terrestrial, in wet forests, 700–3325 m, Cajamarca, Amazonas, San Martín, Huánuco, Madre de Dios.

Mexico to Panama; West Indies; Venezuela and Colombia to Bolivia and Brazil.

Elaphoglossum erinaceum belongs to a very perplexing group. The Peruvian collections are somewhat larger and have more rounded lamina bases than the Mexican and West Indian material, generally stout petioles (stouter than in Central America), 2.5 mm thick, and broad laminae and longer fertile leaves.

Cajamarca: Colasay, *Woytkowski 7019* (US). **Amazonas:** Bagua, E of La Peca, *Barbour 2528* (MO), *2757* (UC). Serranía de Bagua, 17 km E of La Peca, *Gentry et al. 22977* (US). **San Martín:** Mariscal Cáceres, Chochos valley, NW corner Río Abiseo Nat. Park, *Young 2633* (NY). *Young & Watson 3468* (NY). **Huánuco:** Huacachi, Estación near Muña, *Macbride 4690* (US). **Ucayali** (as Loreto): Coronel Portillo, Tingo María–Pucallpa road, *Skog et al. 5154* (US). **Madre de Dios:** Manú, Cerro de Pantiacolla, Río Palotoa, *R. Foster 10849* (F). **Department unknown:** *C. Schunke*, Aug 1908 (UC).

29. *Elaphoglossum erythrolepis* (Fée) Moore, Index fil. 9. 1857.

Acrostichum erythrolepis Fée, Mém. foug. 2: 60. 1845. **TYPE:** Peru, *Dombey* (holotype, P!).

Stem compact, horizontal, ca. 10 mm in diameter, scales linear, often forked into hairlike branches, lustrous, maroon, ca. 20 mm long, with scattered stiff hair-teeth. **Phyllopodia** distinct. **Leaves** fasciculate, 25–36 cm long, 1.4–2.2 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{2}{5}$ the leaf length, with light to dark reddish brown dense scales, these ascending, lanceolate, 3–5 mm long, ciliate. **Lamina** narrowly elliptic, coriaceous, apex acuminate, base cuneate. **Veins** not evident, free, 1 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** abaxially dense, lanceolate, 1.5–2 mm long, ciliate, reddish, costal scales 3–4 mm long, more ascending, adaxially pale, ovate to lanceolate, longer and more ascending on costa, to glabrescent. **Fertile**

leaves longer than the sterile, petiole $\frac{1}{2}$ the leaf length, lamina as large as the sterile; intersporangial scales lacking.

Terrestrial and epipetric, 2900 m, Huánuco, Junín, Apurímac.

Ecuador; Peru.

Huánuco: Mito, *Macbride & Featherstone 1392* (F, in part). Pachitea, *Huapalla 2027* (USM). Along highway between Huánuco y Tingo María, at Río Tulca, *Croat 57899* (F). Chinchao, entre Huánuco y Tingo María, *Ferreira 16981* (GH). **Junín:** Manto to Yaupi, *Woytkowski 6551* (GH). Tarma, Carpapata, *Cerrate 2775* (GH). Huacapistana, *Sandeman 4549* (K), *Killip & Smith 24501, 24175* (NY). **Apurímac:** Abancay, 11–12 km E of Abancay, *Hutchinson 1734* (UC).

30. *Elaphoglossum eximium* (Mett.) Christ, Monogr. Elaphoglossum. 107. 1899.

Acrostichum eximium Mett., Ann. Sci. Nat. Bot. 5, 2: 199. 1864. TYPE: Venezuela, Colonia Tovar, *Moritz 419* (isotype, us!).

Stem short-creeping, ca. 3–4 mm in diameter, scales brown to castaneous, lustrous, linear, entire, 2–4 mm long. **Phyllopodia** lacking. **Leaves** fasciculate, to 44 cm long, 1.3 cm broad. **Petiole** short, $\frac{1}{10}$ – $\frac{1}{16}$ the sterile leaf length, densely clothed with short, brown, subulate scales. **Lamina** linear, texture thin, apex acuminate, base attenuate, margin slightly crenulate. **Hydathodes** evident. **Lamina scales** conspicuous but sparse on costa, smaller on margin, mostly between crenulations, minute punctae inconspicuous on lamina surfaces. **Fertile leaves** shorter than the sterile, petiole $\frac{3}{4}$ the fertile leaf length, lamina smooth-margined, lanceolate to narrowly elliptic, apex apiculate, base cuneate to rounded; intersporangial scales lacking.

Epiphytic or terrestrial in wet forests, 1800–2320 m, San Martín, Huánuco, Cuzco.

Mexico to Panama; Colombia; Venezuela; Ecuador; Peru.

Peruvian material differs from plants of Venezuela and Central America in having the fertile lamina base cuneate or rounded rather than truncate to subcordate and may represent a distinct taxon.

San Martín: Rioja, Venceremos, *D. Smith 4434* (UC). **Huánuco:** Huacachi, near Muña, *Macbride 4131* (F, US). **Cuzco:** La Convención, Huayopata, *Peyton & Peyton 885* (GH).

31. *Elaphoglossum flaccidum* (Fée) Moore, Index fil. 356. 1862.

Acrostichum flaccidum Fée, Mém. foug. 2: 35. t. 7, f. 2. 1845. SYNTYPES: Guyana, Oyapoc, *Leprieur*, in 1834 (P!); *Schomburgk 448* (B!); S. Yago de Cuba, *Linden 2058* (P!); Guadalupe, *Lezarde, l'Herminier* (P!); Martinique, *Heraud*.

Stem compact, horizontal, ca. 3–4 mm in diameter, scales linear-lanceolate, lustrous, blackish brown, 3–4 mm long, entire, somewhat deciduous. **Phyllopodia** evident. **Leaves** fasciculate, 23–37 cm long, 2.3–3.6 cm broad. **Petiole** ca. $\frac{1}{20}$ the sterile leaf length, with orange-tan scales appressed, 1–2 mm long, with weak hairlike teeth. **Lamina** narrowly elliptic, chartaceous, apex acuminate, base narrowly cuneate. **Veins** evident, free, 1–1.5 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** few, like those of petiole at costa base. **Fertile leaves** shorter than the sterile, petiole ca. $\frac{1}{2}$ the fertile leaf length, the lamina narrowly elliptic; intersporangial scales lacking.

Epiphytic in wet forests, 600–1300 m, Amazonas, San Martín, Huánuco, Pasco, Junín, Madre de Dios.

West Indies; Guianas; Venezuela: Colombia to Bolivia.

Amazonas: Prov. Bagua, Quebrada Tambillo, *Wurdack 1989* (US). **San Martín:** Mariscal Cáceres, Palo Blanco, al oeste del Puente, Tocache Nuevo, *J. Schunke V. 5656* (F), *Plowman 7469* (F). Tingo María, jungle E of Tingo María, *Allard 20601, 20941* (US), *21388* (GH, US). Mishuyacu near Iquitos, *Klug 1461* in part (F). **Huánuco:** Leoncio Prado, Rupa Rupa, al este de Tingo María, *J. Schunke V. 5192* (F, UC). **Pasco:** Oxapampa, Quebrada Castilla on the Omaiz river, *León & Young 1022* (F). **Junín:** Pichis Trail, San Nicolás Azupizu, *Killip & Smith 26122* (US). **Madre de Dios:** Manú, Cerro de Pantiacolla, Río Palotoa 10–15 km NW of Shintuya, *Foster 10752* (GH), *10826* (F, GH).

32. *Elaphoglossum fortipes* Mickel, *sp. nov.*

Rhizomate elongato repenti phyllopodisque longissimis praestans.

Stem long-creeping, 2–3 mm in diameter, scales linear-lanceolate, lustrous, dark brown, 3–4 mm long, entire. **Phyllopodia** evident, 2–3.8 cm long. **Leaves** 1–2 cm apart, 12–15 cm long, 1.1–1.4 cm broad. **Petiole** $\frac{1}{4}$ – $\frac{2}{3}$ the sterile leaf length, with brown scales ascending to widely spreading, 2–2.5

mm long, with minute teeth. **Lamina** very narrowly elliptic, chartaceous, apex acuminate, base cuneate. **Veins** evident, free, 1 mm apart, at 70–80-degree angle. **Hydathodes** lacking. **Lamina scales** on abaxial costa deltate-lanceolate, 1 mm long, adaxially and abaxially scattered, 0.5–1 mm long, orange, deltate to deltate-lanceolate, dentate. **Fertile leaves** unknown.

TYPE—Peru (Cuzco), Puente de Nantto, Valle de Lares, *Bües* 1875 (us).

Habitat unknown, 2000 m, Cuzco.

Thus far known only from the type.

33. **Elaphoglossum glabellum** John Sm., London J. Bot. 1: 197. 1842. **TYPE**: British Guiana, *Schomburgk* 447 (holotype, BM!; isotype, US!).

Acrostichum glabellum (John Sm.) Klotzsch, Linnaea 20: 421. 1847.

Stem short to moderately creeping, 2–3 mm in diameter, scales lanceolate, lustrous, dark brown to black, with pale brown base, margin, and tip, 1–2 mm long, entire or with a few weak teeth, scales tending to be somewhat deciduous, often leaving a partially naked stem. **Phyllopodia** distinct, 4–8 mm long. **Leaves** spaced slightly apart, to 33 cm long, 0.5–1.0 (1.6) cm broad, the margin usually incurved. **Petiole** $\frac{1}{10}$ – $\frac{1}{5}$ the sterile leaf length, naked or with minute appressed scales. **Lamina** linear-elliptic, gradually acuminate at both ends, coriaceous. **Veins** obscure, free, ca. 1 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** lacking. **Fertile leaves** slightly shorter than the sterile, the petiole $\frac{1}{2}$ – $\frac{1}{2}$ the fertile leaf length, the lamina ca. 10 mm broad; intersporangial scales lacking.

Epiphytic in wet forests, 130–1800 m, Loreto, Huánuco, Junín, Cuzco, Madre de Dios.

Mexico to Panama: West Indies; Trinidad; Guyana; Surinam; Venezuela; Colombia to Bolivia.

Loreto: Maynas, Distr. Iquitos, Puerto Almendras, *van der Werff* 9800 (UC). Maynas, Varillal, carretera a Nauta, *Vásquez* 1211 (MO). **Huánuco**: SW slope of Río Lluallapichis watershed on ascent of Cerros del Sira, *Dudley* 13131 (GH). **Junín**: East of Quimiri Bridge, near La Merced, *Killip & Smith* 23993 (GH, NY, US). Satipo, Pichanaki, rodal del Proyecto Peruano-Aleman, *León* 239 (USM). Chanchamayo Valley, *C. Schunke* 115, 172 (F). Schunke Hacienda, above San Ramón, *C. Schunke* A144, A147 (US). **Cuzco**: La Convención, Cordillera Vilcabamba, near Río Apurímac and Hacienda Luisiana, *Dudley* 10061

(GH). **Madre de Dios**: Manú, Cerro de Pantiacolla, Río Palotoa, 10–15 km NNW of Shintuya, *Foster* 10691 (F).

34. **Elaphoglossum glossophyllum** Hieron., Hedwigia 44: 180. 1905, *nom. nov.* for *E. linguaeforme* Hieron. 1904, not Moore, 1857.

Elaphoglossum linguaeforme Hieron., Bot. Jahrb. Syst. 34: 542. 1904, not Moore. 1857. **SYNTYPES**: Colombia, above Popayán, *Lehmann* 6944 (B!, US!), 6943 (not located); Antioquia, near Sonsón, *Lehmann* 7582 (not located).

Stem long-creeping, ca. 2–3 mm in diameter, scales lanceolate to ovate-lanceolate or deltate, dull orange or with lustrous black streaks, 4–7 mm long, with hairlike processes. **Phyllopodia** present. **Leaves** mostly 1–3 cm distant, 16–54 cm long, 2.2–5.0 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{1}{2}$ the sterile leaf length, glabrous. **Lamina** lanceolate, coriaceous, apex acute to acuminate, base broadly cuneate to rounded. **Veins** obscure, free, 1 mm apart, at ca. 80-degree angle. **Hydathodes** lacking. **Lamina scales** lacking, or surfaces with stellate trichomidia to glabrous. **Fertile leaf** longer than the sterile, petiole $\frac{1}{2}$ – $\frac{2}{3}$ the leaf length, the lamina acute to obtuse, nearly equal to the sterile in size; intersporangial scales lacking.

Epiphytic in wet forests, 2200–3500 m, Cajamarca, Amazonas, San Martín, Huánuco, Pasco, Ayacucho, Cuzco.

Colombia; Ecuador; Peru.

Cajamarca: San Miguel, Taulis Playa (Calquis), *Mos-tacero et al.* 1192 (F, NY). Chota, Chota–Tacabamba road, 14 km from Chota, *D. Smith & Vásquez* 3554 (F, MO, UC). **Amazonas**: Chachapoyas, Cerros Calla Calla, E side, 19 km above Leimebamba on road to Balsas, *Hutchison & Wright* 5547 (F, GH, NY, UC). Chachapoyas, Cerros Calla Calla, W side, above Balsas on road to Leimebamba, *Hutchison & Wright* 5810 (F, GH, MO, NY, UC, US). **San Martín**: Mariscal Cáceres, NW corner of Río Abiseo Nat. Park, Chochas, *Young & León* 4735 (USM). **Huánuco**: Caní, Pueblo 7 mi NE at Mito, *Macbride* 3403 (F). Carpisah Pass, 84 km from Tingo María, *Allard* 20985 (US). **Pasco**: Oxapampa, Cumbre de la cordillera San Gutardo, *León* 521 (USM). **Ayacucho**: LaMar, eastern Massif of Cordillera Central, *Dudley* 12027 (GH, US). **Cuzco**: La Convención, grasslands at camp 6, cordillera Vilcabamba, *Dudley* 11041 (GH). Cabecera del Karibeni, *Bües* 1960 (US).

35. **Elaphoglossum gracillimum** Mickel, *sp. nov.*

Rhizomate pergracili, lamina lineari tenui, frondisque stipite elongata et lamina parva recognita.

Stem long-creeping, 1–1.5 mm in diameter, scales linear, lustrous, castaneous, to 4 mm long, entire to minutely and sparsely serrulate. **Phyllopodia** lacking. **Leaves** ca. 1 cm apart, 8–12 cm long, 0.6–1.3 cm wide. **Petiole** $\frac{1}{8}$ – $\frac{1}{4}$ the sterile leaf length, with scales castaneous, widely spreading, 1–2 mm long, lanceolate, finely serrulate toward apex. **Lamina** linear-lanceolate, chartaceous, apex acuminate, base broadly cuneate to rounded. **Veins** evident, free, 1.5–2 mm apart, at 60–70-degree angle. **Hydathodes** distinct. **Lamina scales** subulate, castaneous, scattered, 1 mm long on both surfaces, also punctate with stellate trichomidia. **Fertile leaves** slightly shorter than the sterile, petiole ca. $\frac{1}{2}$ the fertile leaf length, lamina elliptic, apex rounded, base rounded to broadly cuneate, scales of petiole, adaxial surface and abaxial costa ovate, smaller (0.5 mm long), and darker (maroon) than on sterile.

TYPE—Peru, Pasco, Oxapampa, San Alberto, Cordillera de Yanachaga, *van der Werff et al.* 8441 (holotype, NY!; isotypes, MO!, UC!).

Endemic. Epipetric on wet rocks in wet forest, 2300–2500 m, Pasco.

Thus far known only from the type collection.

36. *Elaphoglossum guamanianum* (Sodirol) C. Chr., Index fil. suppl. 1: 42. 1913.

Acrostichum guamanianum Sodirol, Sert. fl. ecuat. 2. 35. 1908. TYPE: Ecuador, “in pascuis andin. andium orient. in m. Guamani,” *Sodirol*, Jan. 1900 (holotype, P!; isotype, B!).

Stem compact, horizontal, 4–5 mm in diameter (ca. 1 cm with scales and phyllopodia), scales linear-deltate, lustrous, dark red-brown, 1.5–2 mm long, with stiff hairlike teeth. **Phyllopodia** present. **Leaves** approximate, 17–35 cm long, 1.0–1.7 cm broad. **Petiole** $\frac{1}{8}$ – $\frac{1}{4}$ the sterile leaf length, scales scattered, much reduced, to 1 mm long, with long hairlike teeth, dark red-brown, lustrous, appressed. **Lamina** linear-elliptic, chartaceous, apex acuminate, base narrowly cuneate. **Veins** obscure, ca. 1 mm apart, at 70-degree angle. **Hydathodes** lacking. **Lamina scales** adaxially lacking, abaxially loosely clothed with scales 0.5–1 mm long, orange-tan, lanceolate, with long hairlike teeth, costal scales scattered, dark, as on petiole. **Fertile leaves** slightly shorter than the sterile, petiole ca. $\frac{1}{2}$ the leaf length, lamina only slightly narrower than the sterile, apex acute; intersporangial scales lacking.

Epiphytic in wet forests, 1700 m, Amazonas. Ecuador; Peru.

Peruvian specimens match in that costa scales are small and black, the laminar scales are small (0.5–1 mm long), but lamina is wider in Ecuadorian material (3.5–4.1 cm vs. 1.4–1.7 cm). *Elaphoglossum guamanianum* is similar to *E. paleaceum* in the black, stiffly dentate stem scales and long-ciliate laminar scales, but it differs in the costal scales being black, the laminar scales small, and the scales are much smaller overall.

Amazonas: Prov. Bagua, 12 km E of La Peca, *Barbour* 2564 (F, MO, NY, UC).

37. *Elaphoglossum hartwegii*. (Fée) Moore, Index fil. xvi. 1857.

Acrostichum hartwegii Fée, Mém. foug. 2: 53, t. 9, f. 2. 1845. TYPE: “Quito, Popayán, Bogotá,” *Hartweg* 1486 (F!, Herb. Webb, & G, Herb. Delessert).

Stem long-creeping, 1–1.5 mm in diameter, scales linear-lanceolate, castaneous, lustrous with markedly paler margins, with sagittate base, entire, ca. 3 mm long. **Phyllopodia** distinct. **Leaves** often 1 cm apart, to 22 cm long, 1.2 cm broad. **Petiole** $\frac{1}{2}$ – $\frac{2}{3}$ the sterile leaf length, scales mostly 1–2 mm long, brown with pale margin, appressed to slightly spreading, entire to slightly dentate. **Lamina** linear-lanceolate, apex acuminate to acute or obtuse, base cuneate. **Veins** inconspicuous, free, 0.8–1 mm apart, at 60–70-degree angle. **Hydathodes** present but inconspicuous, usually hidden under scales. **Lamina scales** of adaxial surface generally abundant but not overlapping, lanceolate to deltate, peltate, brown with pale margins, adaxial surface often essentially glabrous. **Fertile leaves** slightly taller than the sterile, petiole $\frac{2}{3}$ – $\frac{3}{4}$ the fertile leaf length, lamina similar in size and shape to the sterile; intersporangial scales lacking.

Terrestrial and epipetric in paramos, 4000–4700 m, Junín, Madre de Dios.

Mexico; Guatemala; Costa Rica; Colombia to Bolivia.

This is often mistaken for *E. mathewsii*, from which it can be distinguished by the broader, erose lamina scales without ciliate base. The two occasionally grow together but are distinct. It is even more closely allied to *E. rosenstockii*, which has similar scales, but has a wider creeping stem and scales on the abaxial lamina surface.

Junin: Mount La Juntay, near Huancayo, *Killip & Smith 22053* (GH [mixed with *mathewsii*], NY). Huaytapallana, *Tiller 122* (USM). **Madre de Dios:** Piñasniocj, Pantiacolla Pass, *Cook & Gilbert 1792* (US).

38. *Elaphoglossum hayesii* (Kuhn) Maxon, Proc. Biol. Soc. Wash. 46: 105. 1933.

Acrostichum hayesii Kuhn, Linnaea 36: 43. 1869.
TYPE: Panama, *Sutton-Hayes 30*, (holotype B!)

Similar to *E. piloselloides* except: **lamina** thin, oblong, rounded at base, with **hydathodes** apparent; **fertile lamina** orbicular.

Terrestrial or epipetric on dripping cliffs, 400–1500 m, San Martín, Junín.

Panama; Venezuela; Colombia; Peru.

San Martín: Boquerón Pass, 92 km from Tingo María on highway to Pucallpa, *Allard 2221*, in part (US). **Junin:** Chanchamayo Valley, *C. Schunke 318* (F).

39. *Elaphoglossum haynaldii* (Sodirol) Losch, Mitt. Bot. Staatssamml. München 1: 21. 1950.

Acrostichum haynaldii Sodirol, Recens. crypt. vasc. Quit. 80. 1883. TYPE: Ecuador, Los Colorados, *Sodirol* (not located).

Stem short-creeping, ca. 5 mm in diameter, scales lanceolate, dark orange to maroon, ca. 5 mm long, entire or with irregular teeth. **Phyllopodia** lacking. **Leaves** fasciculate, to 40 cm long, 1.3–2.4 cm broad. **Petiole** ca. $\frac{1}{4}$ the sterile leaf length, with scales many, spreading, reddish, subulate, 4–6 mm long; petiole also with minute erect glandular trichomes ca. 0.2 mm long. **Lamina** linear-elliptic, chartaceous, apex acuminate to acute-cuspidate, base cuneate. **Veins** obscure, free, 1.5–2 mm apart, at ca. 60-degree angle. **Hydathodes** evident. **Lamina scales** subulate, reddish, conspicuous, 4–6 mm long, uniformly and liberally distributed over the surfaces, margin and costa, lamina also with minute, erect, glandular trichomes. **Fertile leaves** unknown, but expected to be much shorter than the sterile, lamina orbicular to oblong; intersporangial scales lacking.

Epipetric in wet forests, 1500–2450 m, Ayacucho, Cuzco.

Ecuador; Peru.

This differs from *E. siliquoides* (Jenm.) C. Chr. (of Jamaica) in being epipetric, and having resinous petiole and stem, shorter lamina scales, conspicuous hydathodes, and slender stem.

Ayacucho: Ccarrapa, between Huanta & Río Apurímac, *Killip & Smith 22392* (F, NY, US). **Cuzco:** Paucartambo, Manú Nat. Park, *Skog & Skog 5205* (US). Paucartambo, Pillawata, Paso del Aguila, *Vargas 22993* (GH).

40. *Elaphoglossum hickenii* (Sodirol) C. Chr., Index fil. suppl. 1: 42. 1913.

Acrostichum hickenii Sodirol, Sert. fl. ecuat. 1: 35. 1908. TYPE: Ecuador, in silv. suband. vulc. Tungurahua, *Sodirol*, Dec. 1904 (isotypes, s!, us!).

Stem compact, 4–6 mm in diameter, scales linear-lanceolate, lustrous, castaneous to black-maroon, 3–4 mm long, entire. **Phyllopodia** present, obscured by scales. **Leaves** approximate, 48–64 cm long, 2.5–4.1 cm broad. **Petiole** $\frac{1}{2}$ the leaf length, scales moderately dense, appressed to ascending, lanceolate to linear-lanceolate, orange-tan, some with dark red tip or center, erose to very short-ciliate. **Lamina** narrowly elliptic, chartaceous, apex acuminate, base broadly cuneate. **Veins** ca. 1 mm apart, at 70-degree angle, hidden by scales. **Hydathodes** lacking. **Lamina scales** adaxially sparse to lacking, ovate-lanceolate to lanceolate, orange-tan, short-ciliate; abaxially ovate-lanceolate to lanceolate, orange, ciliate, 1–2 mm long; costal scales orange, some with maroon center, 1–2 mm long, the larger ones erose to short-ciliate. **Fertile leaves** nearly equalling the sterile in length, petiole $\frac{2}{3}$ the leaf length, lamina slightly narrower than the sterile, apex obtuse, base subtruncate; costal scales linear-lanceolate, ciliate, red-centered, intersporangial scales lacking.

Terrestrial on steep, rocky slopes, ca. 1800–3000 m, Apurímac, Huánuco, Cuzco.

Ecuador; Peru.

Elaphoglossum hickenii is similar to *E. cuspidatum* except: abaxial lamina scales ovate to lanceolate, loosely arranged, not appressed, the costal scales lanceolate, dark red-centered. It closely resembles *E. orbignyanum* but differs in the abaxial lamina scales being loosely arranged and the stem scales nonciliate. In general appearance it may also be taken for *E. laminarioides*, but the petiole and lamina scales are lanceolate rather than round.

The epithet was originally published as “hike-

nii" and so combined by Christensen, but Mille (Nov. Recens. 28. 1928) added the "c". The spelling is mixed on type specimens; e.g., an isotype (s) is labelled "hikenii" but with a "c" inserted in the same hand. There is no reference to the name in the protologue, but it is likely named for the Argentine botanist Cristóbal M. Hicken.

Apurímac: Abancay, Bosque Ampay, *Hocking* 36 (USM). **Huánuco:** Mito, *Macbride & Featherstone* 1392 (US). Near Huánuco, *Calderon*, 8 June 1967 (USM). **Cuzco:** Paucartambo, Chacapampa, *Vargas* 9880 (UC). Machu Picchu, *Ferreya* 27070 (GH), *Saunders* 462A (K), *Tryon & Tryon* 5397 (GH), *D'Arcy* 13771 (MO).

41. ***Elaphoglossum hieracioides*** Mickel, *Brittonia* 39: 320. 1987. TYPE: Venezuela, Aragua, Tovar, *Fendler* 268 (holotype, us!; isotypes, GH!, MO!).

Similar to *E. piloselloides* except: fertile lamina narrowly oblanceolate, much longer than broad, often inrolled, base cuneate.

Terrestrial on clay banks and in open woods, 750–2300 m, Amazonas, San Martín, Huánuco, Pasco, Junín, Ayacucho.

Venezuela; Colombia; Peru.

Amazonas: Chachapoyas, slopes of Cano Santa Lucia E of Chachapoyas, *Wurdack* 743 (F, GH, NY, US). **San Martín:** Boquerón Pass, 92 km from Tingo María on highway to Pucallpa, *Allard* 2221, in part (us). **Huánuco:** Muña, *Bryan* 469 (F, GH). **Pasco:** Oxapampa, around Villa Rica, *van der Werff et al.* 8277 (MO, UC). **Junín:** Chanchamayo Valley, *C. Schunke* 474 (F). **Ayacucho:** Ayna, between Huanta & Río Apurímac, *Killip & Smith* 23130 (F, GH, NY, US).

42. ***Elaphoglossum horridulum*** (Kaulf.) John Sm., *Bot. Voy. Herald* 232. 1854.

Acrostichum horridulum Kaulf., *Enum. fil.* 58. 1824. TYPE: Brazil, *Otto* (holotype, not located).

Stem compact, horizontal to ascending, ca. 2 mm in diameter, scales linear-lanceolate, entire, orange, lustrous, 3–5 mm long. **Phyllopodia** lacking. **Leaves** fasciculate, 7–13 cm long, 0.5–0.9 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{1}{2}$ the sterile leaf length, with scales subulate, orange to maroon, ca. 3 mm long, widely spreading, and with scattered minute erect glandular trichomes. **Lamina** narrowly to linear elliptic, chartaceous, apex acute, base narrowly cu-

neate. **Veins** obscure, free, 1.5–2 mm apart, at ca. 30-degree angle. **Hydathodes** evident. **Lamina scales** subulate, tan to dull orange, evenly distributed on both surfaces, and with minute, inconspicuous, gland-tipped trichomes. **Fertile leaves** $\frac{2}{3}$ as long to slightly surpassing the sterile in length, petiole $\frac{3}{4}$ – $\frac{7}{8}$ the fertile leaf length, lamina elliptic, apex obtuse, base broadly cuneate; intersporangial scales lacking.

Epipetric in wet forests, ca. 450 m, San Martín, Junín.

Venezuela; Peru; Bolivia; Brazil.

The Brazilian material is often somewhat smaller but there seems to be no substantial difference.

San Martín: Lamas, along Río Curiyacu, 8 km above San Antonio, *Belshaw* 3609 (F, GH, NY, UC, US). Near Tarapoto, *Spruce* 4040 (GH, NY, US). **Junín:** Chanchamayo Valley, *C. Schunke* 474 (us).

43. ***Elaphoglossum huacsaro*** (Ruíz) Christ, *Monogr. Elaphoglossum* 96. 1899.

Acrostichum huacsaro Ruiz, *Mem. sobre la legitima Calaguala*, 57. 1805. TYPE: Peru, *Ruiz* 54 (B!, BR!; photos, F, US).

Acrostichum calaguala Klotzsch, *Linnaea* 20: 421. 1847. SYNTYPES; Peru, in *Andium nemoribus*, *Ruiz* 54 (B!, BR!); Colombia, Paramo de Mucute, *Moritz* 315 (not located).

Elaphoglossum calaguala (Klotzsch) Moore, *Index fil.* 7. 1857.

Stem short creeping to ascending, 3–5 (9) mm in diameter, scales linear-lanceolate, black, lustrous, entire, 1–2 mm long. **Phyllopodia** indistinct. **Leaves** fasciculate, 14–31 cm long, 0.8–1.9 cm broad. **Petiole** $\frac{1}{4}$ – $\frac{1}{3}$ the sterile leaf length, with scales ovate, dark to pale, often pale with dark sclerotic tip, 1 mm long, entire, mostly appressed, a few spreading. **Lamina** narrowly elliptic, chartaceous, apex acute to obtuse, base narrowly cuneate. **Veins** obscure, free, ca. 1 mm apart, at ca. 60-degree angle. **Hydathodes** lacking. **Lamina scales** reduced to resinous dots on both surfaces, scales along lamina margin ovate and entire, ca. 1 mm long, some scattered on costa abaxially. **Fertile leaves** far exceeding the sterile in length, but lamina narrower, petiole nearly as long as the entire sterile leaf; intersporangial scales lacking.

Epiphytic in wet forests, 2050–3200 m, Cajamarca and Amazonas south to Huancavelica and Cuzco.

Mexico to Panama; West Indies; Colombia to Bolivia.

Cajamarca: San Miguel, Niepos, *Quiroz 1539* (F). **Amazonas:** Chachapoyas, Cerros Calla Calla, 5 km above Leimebamba, *Hutchison & Wright 4818* (F, NY, UC, US). Chachapoyas, cerros Calla Calla, west side, 45 km above Balsas, *Hutchison & Wright 5799* (UC). Cordillera de Calla Calla, Balsas–Leimebamba road, *Duncan 2607* (UC). **San Martín:** Huallaga, Valley of Río Apisoncho, *Hamilton & Holligan 901* (K), 908 (UC). Mariscal Cáceres, near La Playa camp, Río Abiseo Nat. Park, *Young & León 4950* (USM). **Huánuco:** W of Carpath, *Stork & Horton 9892* (UC). Huánuco, Carpath Km 453, *Plowman 6066* (GH). Huanuco–Tingo María road, *Luteyn 5453* (UC). **Pasco:** Oxapampa, Canyon de Huancabamba, *León 618* (F). Oxapampa, border of Yanachaga Nat. Park, *León et al. 955* (F). **Junín:** Carpathata above Huacapistana, *Killip & Smith 24411* (NY), 24414 (UC, US). **Huancavelica:** Prov. Tayacaja, Quebrada, *Stork & Horton 10312* (US). **Ayacucho:** Condorcunca, *Barron 16 May 1964* (USM). **Apu- rimac:** E of Abancay, road to Cuzco, *Hutchison 1733* (UC). **Cuzco:** Paucartambo, between Pillawata and Patria (Koshipata Valley), *Plowman & Davis 4939* (GH). Dist. Vilcabamba, Valle San Miguel Convención, Yungacalmarica, *Bües 2056* (US).

44. *Elaphoglossum hystrix* (Kunze) Moore, Index fil. 10. 1857.

Acrostichum hystrix Kunze, Linnaea 9: 26. 1834.
TYPE: Peru, Huánuco, Pampayaco, *Poeppig* (holotype, LZ, destroyed; isotype, B?).

Stem lacking, probably compact, scales linear-lanceolate, lustrous, castaneous, 3–4 mm long, entire. **Phyllopodia** present. **Leaves** approximate, 30–33 cm long, 1.4–1.8 cm broad. **Petiole** about $\frac{1}{2}$ the sterile leaf length, scales scattered, dark red-brown, subulate, patent, ca. 3 mm long, entire, and also with scattered, 2–3-celled, erect, glandular trichomes ca. 0.1 mm long. **Lamina** linear, chartaceous, apex acuminate, base cuneate. **Veins** evident, 1–1.7 mm apart, at 70–80-degree angle. **Hydathodes** lacking. **Lamina scales** adaxially scattered, red-brown, subulate, 1–1.5 mm long on surface, 1.5–2 mm long on margin, 1.5–2 mm long on costa, most abundant on margin and costa; abaxially abundant on costa, sparse on surface, and also with scattered, linear trichomidia ca. 0.2 mm long. **Fertile leaves** unknown.

Endemic. Habitat unknown but presumably epiphytic in wet forests. Huánuco, Junín.

Similar to *E. erinaceum* except: lamina linear elliptic, 1.4–1.8 cm broad, long-acuminate at apex, narrow at base.

Huánuco: Cuchero, *Poeppig*, July 1829 (photo of photo at BM). **Junín:** Villa Amoretti, *Kunkel 535* (GH).

45. *Elaphoglossum jucundum* Mickel, *sp. nov.*

Rhizomate repenti squamis patulis fuscis obsito et lamina parva apice cuspidata abaxialiter glandulosa squamisque dentatis instructa notabile.

Stem wide-creeping, ca. 1 mm in diameter, scales linear, lustrous, dark reddish brown, 3–4 mm long, spreading and recurved, sparsely denticulate and with a few short cilia at scale base. **Phyllopodia** present. **Leaves** 3–5 mm apart, 1.5–3.5 cm long, 0.6–1.1 cm broad. **Petiole** ca. $\frac{1}{3}$ the sterile leaf length, with scales linear-lanceolate, dark brown to orange, lustrous, 1.5–2 mm long, denticulate, ciliate at scale base, spreading, and with resinous dots. **Lamina** ovate-lanceolate, chartaceous, apex acuminate, base rounded. **Veins** obscure, ca. 1 mm apart, at ca. 60-degree angle. **Hydathodes** lacking. **Lamina scales** curved, ciliate, 1–1.5 mm long, mostly orange, some dark red-brown along abaxial costa, more abundant abaxially, with resinous dots on both surfaces. **Fertile leaves** unknown.

TYPE—Peru, Choquezuffa, al pie del Nevado, *Bües 1379* (holotype, US!).

Endemic. Epiphytic in wet forests, ca. 900 m, Cuzco.

Thus far known only from the type.

46. *Elaphoglossum killipii* Mickel, *sp. nov.*

Ab *E. tenuicula* fronde fertiles longes superanti, habitu epiphytico, regionis inferiosis incola diversum.

Stem short-creeping, 1.5–2 mm in diameter, scales linear, with twisted hairlike tip, lustrous, castaneous, 1–1.5 mm long, entire. **Phyllopodia** present. **Leaves** approximate, 75–10 cm long, 2.5–3 cm broad. **Petiole** about $\frac{1}{2}$ the sterile leaf length, with dense scales appearing as stellate trichomes with resinous base. **Lamina** linear, chartaceous, apex acuminate, base attenuate. **Veins** not visible. **Hydathodes** lacking. **Lamina scales** appearing as stellate or substellate trichomes, adaxially white to orange, abaxially more abundant, orange, with resinous base. **Fertile leaves** longer than the sterile (to twice as long), petiole ca. $\frac{2}{3}$ the leaf length, lamina broader than the sterile (5–6 mm broad); intersporangial scales lacking.

TYPE—Peru, Junín, San Ramón, *Killip & Smith* 24772 (holotype, US!).

Endemic. Epiphytic in wet forests, 900–1300 m, Junín.

This is close to *E. tenuiculum* but distinct in the substellate trichomes rather than being strictly stellate, the fertile leaf much longer than the sterile, plants epiphytic rather than terrestrial, and occurring at lower elevation (900–1300 vs. 1500–3000 m).

47. *Elaphoglossum laminarioides* (Fée) Moore, Index fil. 10. 1857.

Acrostichum laminarioides Fée, Mém. foug. 2: 57. t. 12. 1845. TYPE: French Guiana, *Leprieur* in 1834 (holotype, P!).

Stem short-creeping, ca. 3–5 mm in diameter, scales linear-lanceolate, lustrous, dark brown to black, 3–5 mm long, with short teeth. **Phyllopodia** distinct. **Leaves** fasciculate, 32–104 cm long, 4.1–5.4 cm broad. **Petiole** about $\frac{2}{3}$ the sterile leaf length, with pale, appressed, round, peltate, ciliate scales ca. 1 mm long. **Lamina** narrowly elliptic, chartaceous, apex acuminate to cuspidate, base attenuate. **Veins** obscure, free, 1 mm apart, at ca. 80-degree angle. **Hydathodes** lacking. **Lamina scales** on both surfaces round, peltate, ciliate, white, 1 mm in diameter. **Fertile leaves** shorter than the sterile, petiole $\frac{1}{3}$ the fertile leaf length, the lamina linear, 9–12 mm wide; intersporangial scales lacking.

Epiphyte in wet forests, 600–1300 m, San Martín, Junín, Ayacucho, Cuzco.

Venezuela; Ecuador; Peru.

This plant has white, round, peltate, ciliate scales on the petiole and the lamina surfaces.

San Martín: Mariscal Cáceres, Palo Blanco, al oeste del Puente, Tocache Nuevo, *J. Schunke* V. 5673 (NY). **Tingo María,** *Allard* 21586 (GH, US). **Junín:** E of Quimiri Bridge, near La Merced, *Killip & Smith* 23960 (NY, US). **Prov. Jauja,** Valle de Sanibeni, *Ridoutt* 12262 (US). **Ayacucho:** Carrapa, between Huanta and Río Apurímac, *Killip & Smith* 22424 (NY). **Cuzco:** Machu Picchu, *Coronado* 109 (UC).

48. *Elaphoglossum lanatum* Mickel, *sp. nov.*

Laminae squamis appressis et costae obscuris ovato-lanceolatis erosis inferne dissectis ab *E. deorso* diversa,

ab *E. nervoso* laminae squamis erectis longe ciliatis distantior.

Stem compact, horizontal, 4–7 mm in diameter, scales linear-lanceolate, lustrous, black, 3–5 mm long, dentate, at least toward base. **Phyllopodia** present but hidden by scales. **Leaves** fasciculate, 15–38 cm long, 0.8–1.5 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{1}{2}$ the leaf length, scales orange, appressed, round, erose to short-ciliate, 1 mm in diameter, also with dark, ascending, lanceolate, erose scales 2–3 mm long. **Lamina** narrowly elliptic, chartaceous, apex obtuse, base narrowly to broadly cuneate. **Veins** obscure, free, 1 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** adaxially round to lanceolate, white-membranous (silvery), 1–2 mm long, erose, abaxially the dense, erect scales more or less round with long cilia, longer than scale body, costal scales broad-ovate, white, dark-centered, ovate, 1–2 mm long, adaxially round to lanceolate, white-membranous (silvery), 1–2 mm long, erose. **Fertile leaves** longer than the sterile, petiole $\frac{2}{3}$ – $\frac{3}{4}$ the fertile leaf length, lamina about equal the sterile in size and shape; intersporangial scales lacking, costa with ovate, white (dark-centered) ciliate scales 1–2 mm long.

TYPE—Peru, Apurímac, Abancay, E of Abancay, road to Cuzco, *Hutchison* 1732 (holotype, NY!; isotypes, F!, GH!, UC!, US!).

Endemic. Terrestrial on brushy roadcuts and steep slopes, 2050–3600 m, Amazonas, Lima, Junín, Ayacucho, Apurímac, Cuzco.

This is variable in the degree of ciliation of the laminar scales; i.e., the scale body ranges from substantial to only very slight.

Amazonas: Chachapoyas, Cerros Calla Calla above Leimebamba, *Hutchison & Wright* 4818A (NY, UC). **Alrededores de Leimebamba,** *López et al.* 4377 (GH). **Lima:** Canta, Huamantanga, *Saunders* 1253 (GH). **Junín:** Tarma, between Palca and Carpapata, *Stork* 10959 (UC). **Huancayo,** arriba de Huancayok, *Tovar* 2792 (GH). **Ayacucho:** Carrapa, between Huanta and Río Apurímac, *Killip & Smith* 22282 (NY). **Apurímac:** Abancay, laderas altos de Abancay, *Vargas C.* 16596 (GH). **Cuzco:** Paruro, *Vargas C.* 7914 (GH). **Department unknown:** *Ruíz & Pavón* (US ex Herb. Kew).

49. *Elaphoglossum lasioglottis* Mickel, *sp. nov.*

Ab *E. nigrocostato* lamina apice obtusa costaeque squamis latioribus dilutius nigris dissimile.

Stem compact, horizontal, 2–5 mm in diameter, scales linear, lustrous, castaneous to dark red-brown, 3–5 mm long, with sparse, sometimes deciduous hair-teeth. **Phyllopodia** evident. **Leaves** fasciculate, 8–25 cm long, 0.6–1.2 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{1}{2}$ the sterile leaf length, with dark red-brown to black scales appressed to spreading, 1–2 mm long, dentate, appearing resinous. **Lamina** narrowly elliptic, subcoriaceous, apex obtuse to acute, base cuneate. **Veins** obscure, free, 1 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** abaxially ovate-lanceolate, orange, ciliate, costa larger, lanceolate, red-brown, short-ciliate, adaxially pale orange, dense, round to lanceolate, 1–2 mm long, cilio-denticulate. **Fertile leaves** slightly shorter or longer than the sterile, petiole ca. $\frac{2}{3}$ the fertile leaf length, lamina about same size and shape as the sterile lamina; intersporangial scales lacking.

TYPE—Peru, La Libertad, Santiago de Chuco, Chota-Shorey, *Sagástegui 11102* (holotype, NY!; isotype, GH!).

Epipetric in damp banks, rock crevices, and along streams, 2800–3250(–4200) m, Piura, Cajamarca, La Libertad, Ancash, Huancavelica.

Colombia to Bolivia.

This is closely related to *E. nigrocostatum* Mickel, of Venezuela.

Piura: Huancabamba, above Canchaque on road to Huancabamba, *Hutchison 1644* (F, NY, UC). **Cajamarca:** San Miguel, Cerro Quillón (Agua Blanca), *Mostacero L. et al. 1299* (F). **La Libertad:** Otuzco, Otuzco, above Agalpampa on road Trujillo-Quiruvilca, *Saunders 893* (F, GH). 3 km west of Huamachuco, *Correll & E. Smith P933* (GH). **Ancash:** Yungay, Huascarán Nat. Park, Quebrada Parla, *D. Smith et al. 9173* (NY). **Huancavelica:** Tayacaja, 1 km before Huari, *Saunders 1142* (F, GH).

50. *Elaphoglossum latevagans* Mickel, *sp. nov.*

Rhizomate longe repenti squamis linearibus nigris induto necnon lamina lanceolata hydathodiis squamisque linearibus badiis provisa distinguibilis.

Stem long-creeping, 2–3 mm in diameter, often with some white patches, scales linear-lanceolate, lustrous, maroon, 1.5–2 mm long, entire. **Phyllopodia** lacking. **Leaves** distant, mostly 5–20 mm apart, 30–47 cm long, 1.8–3.0(4.8) cm broad. **Petiole** about $\frac{1}{2}$ the sterile leaf length, scales scattered, linear, dark brown to tan, appressed to ascending, 2–3 mm long, more and darker distally, and extending onto lamina, those of costa with dark base

or center, those on lamina pale, on both surfaces, 2–5 mm long. **Lamina** lanceolate to narrowly elliptic, chartaceous, apex acuminate to caudate, base narrowly to broadly cuneate. **Veins** evident, free, ca. 1 mm apart, at ca. 60-degree angle. **Hydathodes** distinct. **Lamina scales** abaxially scattered, linear, tan, entire, 3 mm long, those on costa with reddish brown sclerotic streaks, adaxially similar but 2 mm long and lacking streaks on costal scales. **Fertile leaves** approximately equalling sterile ones in length, petiole about $\frac{2}{3}$ the fertile leaf length, lamina lanceolate, dark scales on costa and pale ones among sporangia.

TYPE—Peru, Amazonas, Chachapoyas, Cerros Calla Calla, *Hutchison & Wright 5808* (holotype US!; isotypes, F!, GH!, NY!, UC!).

Endemic. No habitat data; 3100 m, Amazonas.

The paratype has a broader lamina (to 4.8 cm) than does the type material.

Amazonas: Chachapoyas, Cerros Calla Calla, *Hutchison & Wright 5808A* (GH).

51. *Elaphoglossum latifolium* (Sw.) John Sm., London J. Bot. 1: 197. 1842.

Acrostichum latifolium Sw., Prodr. 128. 1788. TYPE: Jamaica, Swartz (holotype, s).

Stem short to moderately creeping, 4–10 mm in diameter, scales linear-lanceolate, orange to dull tan or dirty brown to slightly blackish, occasionally somewhat lustrous, to 8 mm long, entire or with occasional hairlike processes. **Phyllopodia** distinct. **Leaves** slightly to distinctly spaced, to 128 cm long, 4.9–9.8 cm broad. **Petiole** usually $\frac{1}{4}$ – $\frac{1}{3}$ the sterile leaf length, glabrous. **Lamina** linear-lanceolate, coriaceous, apex acuminate, base cuneate to broadly cuneate. **Veins** obscure, free, about 1 mm apart, at 70–80-degree angle. **Hydathodes** lacking. **Lamina surfaces** usually naked, but sometimes minute stellate black trichomidia on the abaxial surface. **Fertile leaves** about equal to the sterile ones in dimensions but sometimes slightly narrower or with longer petiole; intersporangial scales lacking.

Epiphytic in wet forests, 550–3800 m, Cajamarca, Amazonas, La Libertad, San Martín, Loreto, Huánuco, Pasco, Junín, Cuzco.

Mexico to Panama; West Indies; Venezuela and Colombia to Bolivia and Brazil.

This is placed in *E. latifolium* in the broad sense. In the narrow sense it is probably limited to the West Indies, but the complex is taxonomically very difficult. The Peruvian material has rather large leaves, with moderately creeping stems.

Cajamarca: Contumazá, bosque de Cachil (Cascas-Contumazá), *Lopez M. et al. 9112* (F, GH). **Amazonas:** Chachapoyas, Cerros Calla Calla, 45 km above Balsas, midway on road to Leimebamba, *Hutchison & Wright 5796* (F, GH, NY, UC, US). **La Libertad:** Otuzco, Huaranchal, *Sagastegui A. 0199* (GH). **San Martín:** Mariscal Cáceres, Tocache Nuevo, Cerro Sinsin, 15 km W of Tocache, *Plowman & Schunke V. 11463* (F). **Loreto:** Mishuyacu near Iquitos, *Klug 1461* (F). **Huánuco:** Muña, *Bryan 541* (F). Prov. Huánuco, Mirador, cerca a Huánuco, *Ridoutt*, Feb. 1940 (GH). **Pasco:** Oxapampa, Gran Pajonal, 2–3 km N of Chequitavo, *D. Smith 5087* (NY). **Junín:** E of Quimiri Bridge near La Merced, *Killip & Smith 23850* (NY). **Cuzco:** Pillahuata, Cerro de Cusilluyoc, *Pennell 14027* (GH, NY).

52. *Elaphoglossum lawyeri* Mickel, *sp. nov.*

Rhizomate compacto, frondibus subsessilibus lineari-ellipticis glabris distinguendum.

Named for Jean Lawyer, who was a volunteer in my office for fifteen years, helping in matters of curation, research, and the American Fern Society.

Stem compact, ca. 5 mm in diameter, scales lanceolate, black, dull, thin, 3–4 mm long, with occasional irregular teeth. **Phyllopodia** present. **Leaves** approximate, 34–42 cm long, 1.8–2.4 cm broad. **Petiole** $\frac{1}{5}$ – $\frac{1}{10}$ ($\frac{1}{5}$) the sterile leaf length, glabrous. **Lamina** linear-elliptic, firmly chartaceous, apex acuminate, base attenuate. **Veins** evident, 1–1.5 mm apart, at ca. 70-degree angle. **Hypodermis** lacking. **Lamina scales** lacking, but sparse, stellate trichomidia on both surfaces. **Fertile leaves** nearly equalling the sterile in length, petiole ca. $\frac{1}{3}$ the leaf length, lamina broader than the sterile (2.8 cm); intersporangial scales lacking.

TYPE—Peru, Pasco (as Junín), Pichis Trail, between San Nicolás and Azupizu, *Killip & Smith 26122* (holotype, NY!).

Endemic. Epiphytic in wet forests, 650–900 m, Pasco.

Thus far known only from the type.

53. *Elaphoglossum laxisquama* Mickel, *sp. nov.*

Lamina magna laxe squamata necnon stipite hirta insignis.

Stem moderately to short-creeping, to 20 cm long, 2–3 mm in diameter, scales linear-lanceolate, lustrous, red-black, 5–7 mm long, with hair-tip and divergent hair-teeth. **Phyllopodia** evident. **Leaves** approximate, to 5 mm apart, 25–53 cm long, 2.0–4.1 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{1}{2}$ the sterile leaf length, with tan to black-streaked scales widely spreading, 3–5 mm long, with hairlike teeth. **Lamina** narrowly elliptic, coriaceous, apex obtuse, base broadly cuneate to rounded or truncate. **Veins** obscure, free, 1 mm apart, at 80-degree angle. **Hypodermis** lacking. **Lamina scales** abaxially ovate to lanceolate, 1–1.5 mm long with long, hairlike teeth, scattered, concentrated at margin, orange to black, costal scales 2–3 mm long, dense, adaxial surface glabrescent or with scattered scales, these 1–2 mm long, orange. **Fertile leaves** longer than the sterile, petiole $\frac{3}{4}$ the leaf length, lamina narrower; intersporangial scales lacking.

TYPE—Peru, San Martín, Mariscal Cáceres, Puerta del Monte, Río Abiseo Nat. Park, *Young 1741* (holotype, NY!; isotype, USM!).

Endemic. Terrestrial and epiphytic in wet forests, 3300–3500 m, La Libertad, San Martín, Pasco, Cuzco.

La Libertad: Patáz, Chirimachay, Patáz, *Young 2960* (NY, USM). **San Martín:** Mariscal Cáceres, forest patch above timberline, Puerta del Monte, Río Abiseo Nat. Park, *Young 1847, 1951* (NY). Mariscal Cáceres, Chochos, Río Abiseo Nat. Park, *Young 2536* (NY). Mariscal Cáceres, Puerto del Monte, Río Abiseo Nat. Park, *Young 1926, 1995* (USM). **Pasco:** Oxapampa, Huancabamba, Sta. Barbara, above Lanturachi, *Foster 10429* (F, GH). **Cuzco:** La Convención, Cordillera Vilcabamba, 28 km walking distance NE from Hacienda Luisiana & Apurímac River, *Dudley 11188* (GH).

54. *Elaphoglossum lechlerianum* (Mett.) Moore, Index fil. 11. 1857.

Acrostichum lechlerianum Mett., Fil. lechl. 1: 3. 1856.

TYPE: Peru, Puno, Tatanara, *Lechler 2522* (isotypes, BR!, s!; photo, US of BR).

Stem creeping, up tree, vertical, ca. 4–6 mm in diameter, scales linear-lanceolate, lustrous, orange, 4–6 mm long, with a few low teeth distally and an occasional hairlike process. **Phyllopodia** present. **Leaves** fasciculate, 26–52 cm long, 2.2–4.2 cm broad. **Petiole** $\frac{1}{8}$ – $\frac{1}{4}$ the sterile leaf length, with orange scales scattered, appressed, ovate to lanceolate, 1–2 mm long, entire. **Lamina** narrowly elliptic, chartaceous, apex acuminate, base atten-

uate. Veins evident, free, 1–1.5 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** abaxially reduced to minute, stellate trichomidia, a few appressed scales on the costa base, adaxially smaller and sparser. **Fertile leaves** about equal the sterile, petiole $\frac{1}{3}$ – $\frac{1}{2}$ the fertile leaf length, the lamina narrow linear-elliptic to linear-oblancoate, 1.0–2.8 cm broad; intersporangial scales lacking.

Terrestrial and epiphytic in wet forests, 1760–2770 m, Amazonas, Huánuco, Pasco, Cuzco, Puno. Ecuador; Peru.

Amazonas: Bagua, 25 km E of La Peca, *Barbour 2954* (MO). Bagua, 17 km E of La Peca, *Gentry et al. 22977 pp* (MO). **Huánuco:** SW slope of Río Lullapichis watershed on ascent of Cerros del Sira, *Dudley 13328* (GH). Prov. Huánuco, Carpish, *C. Vargas C. 5424* (UC). **Pasco:** Chontabamba, Abra “La Suiza,” camino al Río Chontabamba, *León et al. 978* (F). Oxapampa, San Alberto, Cordillera de Yanachaga, *van der Werff et al. 8427* (MO, UC). **Cuzco:** La Convención, Huayopata, 6 km from Incatambo on Lucumayo River, *Peyton & Peyton 1557* (MO). La Convención, Cordillera Vilcabamba, camp 1– $\frac{1}{2}$, *Dudley 10342* (GH). La Convención, 15 km walking NE from Hacienda Luisiana & Apurímac River, Cordillera Vilcabamba, *Dudley 11248* (GH). La Convención, Huayopata, Puncuyo, 10 km SW of Incatambo, *Peyton & King 1413* (GH). Machu Picchu, *Cook & Gilbert 863* (US). Los Palmitos, Cabecera del Río Karibeni, *Bües 1962* (US).

55. **Elaphoglossum leprosum** (Kuhn) Christ, *Monogr. Elaphoglossum* 119. 1899.

Acrostichum leprosum Kuhn, *Linnaea* 36: 48. 1869. TYPE: Peru (Junín), Tarma, *Phillipi* (holotype, B!).

Stem creeping, ca. 2 mm in diameter, scales linear, lustrous, dark brown, 4–6 mm long, with short, patent teeth. **Phyllopodia** evident but obscured by scales. **Leaves** 2–15 mm apart, 16–20 cm long, 1.8–2.1 cm wide. **Petiole** $\frac{1}{3}$ – $\frac{2}{5}$ the sterile leaf length, with tan, black-centered scales widely spreading, 3 mm long, with short patent teeth, also with appressed, peltate, ciliate scales to 1 mm long. **Lamina** lanceolate, chartaceous, apex long-acuminate, base broadly cuneate. Veins obscure, free, ca. 1 mm apart, at 70–80-degree angle. **Hydathodes** lacking. **Lamina scales** abaxially dense, most of them lanceolate, orange, ciliate, 2 mm long, costal scales (some) sclerotic in part, plus a few lanceolate scales with sclerotic patches, adaxially white, lanceolate, ciliate. **Fertile leaves** longer than

the sterile, petiole $\frac{1}{2}$ the fertile leaf length, lamina similar to the sterile except slightly narrower; intersporangial scales lacking.

Endemic. Epiphytic in wet forests, 3950 m, Huánuco, Junín.

Huánuco: Tambo de Vaca, *Macbride 4413* (F).

56. **Elaphoglossum lindenii** (Fée) Moore, *Index fil. xvi*. 1862.

Acrostichum lindenii Fée, *Mém. foug.* 2: 48, t. 18, f. 3. 1845. TYPE: uncertain, four syntypes originally cited.

Stem short-creeping to ascending, ca. 3 mm in diameter, scales linear, maroon, to 8 mm long, with short teeth. **Phyllopodia** lacking. **Leaves** fasciculate, 7–13 cm long, 1.4–2.4 cm broad. **Petiole** $\frac{1}{2}$ – $\frac{3}{4}$ the sterile leaf length, the scales orange, subulate, widely spreading, 2–3 mm long and also with a few minute erect glandular trichomes. **Lamina** ovate to widely elliptic, chartaceous, apex cuspidate, base rounded or subcordate. **Veins** evident, free, ca. 2 mm apart, at 60–70-degree angle. **Hydathodes** distinct. **Lamina scales** subulate, orange to maroon, scattered on both surfaces, 2–3 mm long. **Fertile leaves** slightly shorter than the sterile, petiole to $\frac{4}{5}$ the fertile leaf length, the lamina apex obtuse, base truncate; intersporangial scales lacking.

Epipetric or terrestrial in wet forests, 3700–3840 m, Cajamarca, Ancash, Cuzco.

Mexico to Panama; Venezuela and Colombia to Chile.

Cajamarca: Prov. San Miguel, El Tingo, *Sagástegui 8824* (UC). **Ancash:** Yungay, Huascarán Nat. Park, *D. Smith et al. 10470A* (NY). Prov. Yungay, Yungay, Llanganuco, *Saunders 521* (F, UC). **Cuzco:** Paucartambo, Huaisampillo, *Vargas C. 9963* (UC).

57. **Elaphoglossum lingua** (Raddi) Brack., *U.S. Expl. Exped.* 16: 74. 1854.

Acrostichum lingua Raddi, *Opusc. Sci.* 3: 283. 1819. TYPE: Brazil, Raddi (F! or P!).

Stem long-creeping, ca. 2 mm in diameter, scales sparse, ovate to lanceolate, black, sclerotic, lustrous, 1–2 mm long, with cilia, especially at base.

Phyllopodia present but not always dark. **Leaves** distant, mostly 1–3 cm apart, 9–30 cm long, 3.1–5.2 cm broad. **Petiole** $\frac{1}{4}$ – $\frac{1}{2}$ the sterile leaf length, glabrous or with sparse black or black-tipped scales near petiole base. **Lamina** ovate to lanceolate or oblong, coriaceous, apex obtuse to acute, base narrowly to broadly cuneate. **Veins** obscure, free, 1 mm apart, at ca. 70–80-degree angle. **Hydathodes** lacking. **Lamina scales** lacking, or reduced abaxially to stellate trichomidia. **Fertile leaves** about equal the sterile in length, petiole $\frac{1}{2}$ – $\frac{2}{3}$ the fertile leaf length, the lamina narrowly oblong; intersporangial scales lacking.

Epiphytic in wet forests, 550–1900 m, San Martín, Huánuco, Pasco, Junín, Cuzco.

Costa Rica; Panama; West Indies; Venezuela; Colombia to Bolivia and Brazil.

San Martín: Mariscal Cáceres, Tocache Nuevo, Cerro Sinsin, 15 km W of Tocache Nuevo along road to Puerto Pizana, *Plowman & J. Schunke V. 11460* (F, NY). **Huánuco:** Dist. Churubamba, Puente Durand to Exito, *Mexia 823a* (UC). SW slope of Río Llullapichis watershed on ascent of Cerros del Sira between Laguna & Pelogroso, *Dudley 13205* (GH). Pachitea, slopes in logging area across Río Huancabamba from town Pozuzo near bridge of Oxapampa–Pozuzo road, *Skog et al. 5095* (NY). Cani, *Macbride 3403*, in part (US). **Pasco:** Oxapampa, Oxapampa to villa Rica, *Skog et al. 5046b* (US). Oxapampa, Quebrada Castilla on the Omaiz river, *León & Young 1069* (F). **Junín:** Satipo, Pichanaki, rodal del proyecto Peruano-Aleman, *León 231* (USM). Chanchamayo Valley, *C. Schunke 473, 1441, 1465* (F). E of Quimiri Bridge near La Merced, *Killip & Smith 23992* (NY, US). Pichis Trail, Porvenir, *Killip & Smith 25916* (NY, US), *25698* (US). **Cuzco:** Paucartambo, entre Montanesa & Patria, *C. Vargas C. 16890* (GH).

58. *Elaphoglossum litanum* (Sodirol) C. Chr., Index fil. 310. 1905.

Acrostichum litanum Sodirol, Sert. fl. ecuad. 10. 1905. TYPE: Ecuador, “ad fl. Lita in prov. Esmeraldas,” *Sodirol*, Aug 1904 (holotype, P!; isotypes B!, P!).

Stem compact, 5–8 mm in diameter, scales linear-lanceolate, lustrous, dark red-brown, ca. 5 mm long, entire. **Phyllopodia** not evident, perhaps very short and obscured by crowded, stout petiole bases. **Leaves** approximate, 48–60 cm long, 2.5–4.0 cm broad. **Petiole** about $\frac{1}{10}$ the sterile leaf length, scales ovate-lanceolate, pale, dull, appressed, 2–3 mm long, erose. **Lamina** linear-oblongate, chartaceous, apex acute-acuminate, base attenuate.

Veins evident, 1 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** adaxially deciduous except for fringe of 1 mm, pale, cili-denticulate scales at margin; abaxially glabrous except for much-reduced fimbriate scales on costa. **Fertile leaves** slightly shorter than the sterile, petiole ca. $\frac{2}{5}$ the leaf length, lamina obtuse, slightly narrower than the sterile, adaxial surface densely clothed with pale, round to lanceolate, cilio-denticulate, 1 mm long scales; intersporangial scales lacking.

Endemic. Epiphytic in wet forests, 1800–1900 m, San Martín.

This closely resembles *E. subciliatum* Rosenst. of Costa Rica, but that has a linear, fertile lamina.

San Martín: Rioja, Pedro Ruiz–Moyobamba road, *D. Smith 4503* (UC).

59. *Elaphoglossum longius* Mickel, *sp. nov.*

Ab *E. tenui* stipite laminae longioribus, laminae ipsa squamis basi ciliolatis dorsaliter obsita semovenda.

Stem long-creeping, 1 mm in diameter, scales linear, lustrous, dark red-brown, 2–3 mm long, minutely and sparsely dentate. **Phyllopodia** present. **Leaves** 1–1.5 cm apart, 18–34 cm long, 1.6–2.5 cm broad. **Petiole** ca. $\frac{3}{5}$ the sterile leaf length, scales scattered, linear, orange-tan, 2–3 mm long, minutely denticulate, and smaller ones appressed, more dissected. **Lamina** narrowly elliptic, chartaceous, apex long-attenuate, base cuneate. **Veins** evident, 1.5 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** scattered on both surfaces, linear-lanceolate-deltate adaxially, abaxially lanceolate, ciliate-denticulate with glandular dots. **Fertile leaves** nearly equalling the sterile in length, petiole $\frac{3}{5}$ the leaf length, lamina nearly equalling the sterile in size and shape; intersporangial scales lacking.

TYPE—Peru, Cuzco, Abra de Malaga, 15 km toward Quillabamba, *Ellenberg 4863* (holotype, GH!).

Endemic. Epiphytic in mossy elfin forests, 3740 m, Cuzco.

Similar to *E. tenue* except petiole 10–17 cm long, scales scattered, leaves longer, 22–34 cm, 1.7–2.5 cm broad, lamina scales abaxially deltate-lanceolate, ciliate-based, gland-based, adaxially linear-

lanceolate, scattered; fertile lamina same shape and nearly same size as sterile.

60. *Elaphoglossum luridum* (Fée) Christ, Monogr. Elaphoglossum 33. 1899.

Acrostichum luridum Fée, Mém. foug. 2: 35. t. 19, f. 1. 1845. SYNTYPES: "Guiana" (Guyana), Oya-poc, Leprieur 56 (P!), 385 (P!); "British Guiana" (Guyana), Melinon 373 (P!), Schomburgk 450 (BM!).

Acrostichum schomburgkii Fée, Mém. foug. 2: 32. t. 8, f. 2. 1845. TYPE: "British Guiana" (Guyana), Schomburgk 450 (holotype, P!).

Elaphoglossum schomburgkii (Fée) Moore, Index fil. 14. 1857.

Stem compact, horizontal, ca. 6–10 mm in diameter, scales linear-lanceolate, lustrous, brown to blackish brown, 7–12 mm long, with hairlike processes. **Phyllopodia** present. **Leaves** fasciculate, 26–78 cm long, 5.0–7.6 cm broad. **Petiole** about $\frac{1}{10}$ the sterile leaf length, with black scales appressed to spreading, 3–6 mm long, some further reduced and skeletonized with irregular hairlike processes. **Lamina** oblanceolate to broadly elliptic, coriaceous, apex acuminate, base narrowly cuneate. **Veins** obscure, free, 1–1.5 mm part, at 80-degree angle. **Hydathodes** lacking. **Lamina** abaxially glabrous, adaxially with black skeletonized scales, especially toward lamina base and reduced to stellate trichomidia. **Fertile leaves** shorter than the sterile, petiole $\frac{2}{5}$ the fertile leaf length, the lamina oblanceolate to elliptic, 3–3.5 cm wide; intersporangial scales lacking.

Epiphytic in wet forests, 100–1200 m, San Martín, Loreto, Pasco, Junín, Ucayali, Madre de Dios.

Costa Rica; Panama; West Indies; Trinidad; Guianas; Venezuela; Colombia to Bolivia and Brazil.

San Martín: Mariscal Cáceres, Palo Blanco, at oeste del Puente, Tocache Nuevo, *J. Schunke* V. 5759 (NY). **Tingo María,** *Allard* 21396 (US). **Loreto:** Maynas, Napo, environs of Río Santa María, on trail S of Secoya village of Vencedor, *King* 501 (F). **Pasco:** Oxapampa, Gran Pajonal, trail to Shumahuani from Chequitavo, *D. Smith* 5218 (MO, NY, UC). **Junín:** La Merced, *Killip & Smith* 24013 (NU, US). **Ucayali:** Aguaytía, *Ridoutt* 13091 (US). **Madre de Dios:** Manú, Cerro de Pantiacolla, Río Palotua, 10–15 km NNW of Shintuya, *Foster* 10754 (F).

61. *Elaphoglossum macilentum* Mickel, sp. nov.

Ab *E. squamipedi* lamina sterili anguste elliptica et lamina fertili lineari-elliptica, ulterius stipitis squamis lanceolatis semota.

Stem long-creeping, ca. 1 mm in diameter, scales linear-lanceolate, dull orange-tan, 2–4 mm long, entire. **Phyllopodia** lacking. **Leaves** 3–14 mm apart, 7–12 cm long, 0.7–1.1 cm broad. **Petiole** $\frac{1}{5}$ – $\frac{1}{2}$ the sterile leaf length, with tan-orange scales widely spreading, ovate-lanceolate, 2–3 mm long, subentire, with sparse irregular teeth. **Lamina** narrowly elliptic, chartaceous, apex acute to acuminate, base narrowly cuneate. **Veins** evident, free, 1 mm apart, at 40–60 degree angle. **Hydathodes** lacking. **Lamina scales** very sparse, mostly along abaxial costa. **Fertile leaves** slightly longer than the sterile, petiole $\frac{3}{4}$ the leaf length, lamina linear-elliptic, 1.8–2.5 cm long, 4–5 mm broad; intersporangial scales lacking.

TYPE—Peru, Madre de Dios, Prov. Manú, Parque Nac. Manú, Río Manú, Río Cumerjali, *Foster* 11978 (holotype, F!).

Endemic. On log in wet forest, 350–450 m, Madre de Dios.

Similar to *E. squamipes* except: leaves generally more slender, petiole scales lanceolate to ovate-lanceolate rather than ovate, sterile lamina narrowly elliptic instead of ovate-lanceolate, apex acute to acuminate, base cuneate, fertile lamina linear-elliptic, lamina scales very sparse, vein angle more acute. *Elaphoglossum macilentum* differs from *E. lloense* (Hooker) Moore (Venezuela, Colombia, Ecuador) in the petiole scales appressed, not spreading, and the lamina scales tan, not dark.

Thus far known only from the type.

62. *Elaphoglossum mathewsii* (Fée) Moore, Index fil. 12. 1857.

Acrostichum mathewsii Fée, Mém. foug. 2: 54, t. 2, f. 2. 1845. TYPE: Peru, *Mathews* (holotype, presumably P; frag., B!).

Elaphoglossum longipes Brack., U.S. Expl. exped., Filic. 16: 70. t. 9, f. 2. 1854. TYPE: Peru, Andes, Baños, *Brackenridge* (holotype, US!).

Stem short- to moderately creeping, 2–3 mm in diameter, scales linear-lanceolate, dark red-brown to red-black, lustrous, denticulate, ca. 3 mm long. **Phyllopodia** distinct. **Leaves** spaced, to 1 cm apart, 12–32 cm long, 1.0–1.8 cm broad. **Petiole** $\frac{1}{2}$ – $\frac{2}{3}$ the sterile leaf length, the scales mostly 1–3 mm long, lustrous brown, sclerotic, with pale margin, appressed to slightly spreading, dentate to ciliate near base. **Lamina** narrowly elliptic, subcoriaceous, apex acuminate to acute or obtuse, base cuneate. **Veins** inconspicuous, free, 0.8–1 mm

apart, 60–70-degree angle. **Hydathodes** present but inconspicuous. **Lamina scales** of adaxial surface generally abundant and usually overlapping, lanceolate to deltate, peltate, brown with pale margins, abaxial surface often essentially glabrous, sometimes glandular, occasionally with scattered scales, these ciliate, especially toward base. **Fertile leaves** slightly longer than the sterile, petiole $\frac{2}{3}$ – $\frac{3}{4}$ the fertile leaf length; scales sparse on abaxial costa, lacking among the sporangia.

Terrestrial or epipetric, 3200–5100 m, Cajamarca south to Huancavelica and Madre de Dios.

Mexico to Costa Rica; Venezuela and Colombia to Chile.

I include here *E. longipes*, which may be a distinct taxon. However, the only difference seems to be the very long petiole and linear lamina.

Elaphoglossum mathewsii specimens: **Cajamarca:** Hualgayoc, *Soukup & Carmons 5015* (GH). Prov. Cajamarca, Encanada, Komolka, *Sánchez 193* (GH). Cajamarca, 28 km NW of Cajamarca on road to Pederal, *Ugent & Ugent 5461* (GH). **La Libertad:** Otuzco, *Angulo 1701* (GH). Bolívar, arriba de Bolívar, *Lopez & Sagástegui 1620* (NY), *3221* (GH). **Ancash:** Carhuaz, Huascarán Nat. Park, Quebrada Ishinca, *D. Smith & Budensiek 11265* (NY). **Huánuco:** Mito, *Bryan 202* (F). Tambo de Vaca, *Macbride 4387* (F, US), *Bryan 654, 699* (F). **Lima:** Canta, Carhuai, *Acleto 219* (USM). **Junín:** La Quinua, *MacBride & Featherstone 2026* (F, US). Huancayo, 11 km from Huancayo towards Chameseria, *Saunders 652* (GH). **Huancavelica:** Tayacaja, Pampas, *Gutte 1074* (USM). **Ayacucho:** 14 km NE of La Quinua, *Luteyn 6339* (NY). **Cuzco:** Urubamba, trail from Ch'uso to Cuzco, 2 hrs walk from Chinchero, *King et al. 215* (F, NY). **Madre de Dios:** Pinasniocj, Pantiacolla Pass, *Cook & Gilbert 1839* (US).

Elaphoglossum longipes specimens: **Pasco:** Valle del Paucartambo, hacienda Churu, *Herrera 1643* (US). **Junín:** Huancayo, *Soukup 2009* (GH). **Cuzco:** Saxaihuamán hills, *Herrera 159* (US). Paucartambo, Hacienda Chura, *Herrera 273* (GH, US). Urubamba, Chincheros, *S. King et al. 289* (F, NY). Quispicanchi, Marcapata, *Vargas 13447* (GH). Prov. Cuzco, San Jerónimo, v.d. *Hoogte & Roersch 274* (F).

63. *Elaphoglossum megalurum* Mickel, *sp. nov.*

Elaphoglossum auricomum quoad laminae squamas dissectas et stipitem abbreviatum simulans, sed stipitis squamae latiores et laminae apice caudatae sunt.

Stem short creeping, ca. 2 mm in diameter, scales lanceolate, lustrous, brown, ca. 1 mm long, entire, more or less resinous. **Phyllopodia** evident. **Leaves** approximate, 21–30 cm long, 1.9–2.4 cm broad. **Petiole** $\frac{1}{2}$ the sterile leaf length, with tan scales

appressed to spreading, 1–2 mm long, cilio-dentulate. **Lamina** narrowly elliptic, chartaceous, apex cuspidate to caudate, base cuneate. **Veins** evident, free, 1 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** abaxially and adaxially substellate, adaxially glabrescent with age, abaxial costal scales 1.5–2 mm long, pale, lanceolate, ciliate. **Fertile leaves** not known.

TYPE—Peru, Pasco, Oxapampa, Quebrada Castilla on the Omaiz river, *León & Young 1071* (holotype, F!).

Endemic. Epiphyte in wet forests, elevation unknown, Pasco.

Thus far known only from the type.

64. *Elaphoglossum meladenium* Mickel, *sp. nov.*

Ab *E. latifolio* lamina lineari et stipitis squamis aurantiacis sparsis abstat.

Stem creeping, ca. 4 mm in diameter, scales lanceolate, lustrous, orange, tinged dark brown with age, 7–9 mm long, entire. **Phyllopodia** present. **Leaves** 2–8 mm apart, 25–41 cm long, 2.5–4.0 cm broad. **Petiole** $\frac{2}{5}$ – $\frac{3}{5}$ the sterile leaf length, with scattered orange scales widely spreading toward petiole base, these 4–6 mm long, entire, the lamina surface also with glandular dots, and with spores adhering to the scales to give an appearance of black dots. **Lamina** lanceolate to elliptic, chartaceous, apex acute, base broadly cuneate. **Veins** obscure, free, 1 mm apart, at ca. 80-degree angle. **Hydathodes** lacking. **Lamina scales** on both surfaces with black dots, dark with spores attached plus occasional 1–2 mm ovate scales along costa. **Fertile leaves** slightly longer than the sterile, petiole $\frac{3}{5}$ – $\frac{3}{4}$ the fertile leaf length, lamina narrower than the sterile, 1.9–2.3 cm broad; intersporangial scales lacking.

TYPE—Peru, Ancash, Yungay, alrededores Laguna Llanganuco, *Mostacero L. et al. 1408* (holotype, NY!; isotypes, F!, HUT!).

Endemic. Terrestrial and epipetric in wet forests, 3750–4100 m, Ancash, Cuzco.

Ancash: Huari, Huascarán Nat. Park, slopes & valley of Laguna Ichicpotrero, *D. Smith et al. 12380* (NY). **Cuzco:** Calca, Amparaes, SW from Cuzco, *Nuñez 6726* (MO).

65. *Elaphoglossum melancholicum* Vareschi, Act. Bot. Venez. 1: 109, t. 10B. 1966.

TYPE: Venezuela, Mérida, Páramo Monsalves, *Vareschi 2217* (holotype, VEN).

Stem wide-creeping, branched, ca. 2–4 mm in diameter, scales linear-lanceolate, lustrous, black, sclerotic, 3–5 mm long, with sparse, irregular teeth. **Phyllopodia** evident. **Leaves** 1.5–4 cm distant, (7)18–50 cm long, (0.9)2.8–4.8 cm wide. **Petiole** ($\frac{1}{6}$) $\frac{1}{3}$ – $\frac{1}{2}$ the sterile leaf length, glabrous. **Lamina** lanceolate to elliptic, coriaceous, apex acuminate, base cuneate to rounded. **Veins** evident, free, 1 mm apart, at 70–80-degree angle. **Hydathodes** lacking. **Lamina scales** on abaxial surface scattered, linear to linear-dentate, black, sclerotic, ca. 1 cm long; slightly longer on costa, adaxially with a few by the costa. **Fertile leaves** slightly longer than the sterile, petiole ($\frac{1}{4}$) $\frac{2}{3}$ the fertile leaf length, the lamina about the same shape and width as the sterile or with truncate base; intersporangial scales lacking.

Epiphytic and epipetric, 3000–3400 m, La Libertad, San Martín, Huánuco, Junín.

Venezuela; Colombia; Ecuador; Peru.

Elaphoglossum megarhizon Rosenst. of Bolivia is similar, and if they prove to be the same species, that would be the correct name.

Piura: Huancabamba, above Canchaque, *Hutchison 1636* (UC). **La Libertad:** Pataz, Puerta del Monte, Paso La Sábana, *Lopez & Sagástegui 3464* (GH). Pataz, *Young 2985* (NY, USM). **San Martín:** Mariscal Cáceres, Río Abiseo Nat. Park, Puerta del Monte, *Young 1682* (NY). **Huánuco:** Tingo María, *Allard 1049* (US). Tambo de Vaca, *Bryan 652* (F, US). **Junín:** Concepción, Comas, km 39, road Concepción-Satipo, *Saunders 1049* (GH). **Cuzco:** Machu Picchu, *Soukup 178* (F).

66. *Elaphoglossum metallicum* Mickel, *sp. nov.*

Lamina vivide azurea utraque facie aequibilter squamulis parvis dissectis nigris obsita singularis.

Stem short-creeping, ca. 4–6 mm in diameter, scales linear-lanceolate, lustrous, orange tinged with dark brown, 9–14 mm long, with hairlike processes. **Phyllopodia** present. **Leaves** 3–6 mm distant, 22–67 cm long, 3.7–5.5 cm wide. **Petiole** $\frac{1}{3}$ – $\frac{1}{2}$ the sterile leaf length, with black scales appressed, skeletonized, 1 mm long, with long irregular, processes. **Lamina** lanceolate to broadly elliptic, coriaceous, margin inrolled, apex acute to obtuse, base broadly cuneate. **Veins** evident, free, 1–1.5 mm apart, at ca. 30-degree angle. **Hydathodes** lacking. **Lamina scales** abaxially with scat-

tered skeletonized, reddish-brown scales 1 mm long, adaxially fewer, glabrescent. **Fertile leaves** shorter than the sterile, petiole $\frac{1}{2}$ the fertile leaf length, the lamina narrow, 2.1 cm wide, narrowly lanceolate; intersporangial scales lacking.

TYPE—Peru, San Martín, Zepelacio, near Moyobamba, *Klug 3636* (holotype, NY!; isotypes, F!, GH!, K!, MO!, US!).

Endemic. Epiphytic (?) in wet forests, 750–1100 m, San Martín, Huánuco.

San Martín: Tarapoto, *Ll. Williams 5986* (F). **Huánuco:** SW slope Río Lullapichis watershed on ascent of Cerros del Sira, *Dudley 13169* (GH), *13264* (GH).

67. *Elaphoglossum minutum* (Fée) Moore, Index fil. 12. 1857.

Acrostichum minutum Fée, Mém. foug. 2: 39. t. 10, f. 3. 1845. TYPE: Brazil, near Goyaz, *Pohl* (holotype, w).

Acrostichum unitum Fée, Mém. foug. 2: 44. 1845. SYNTYPES: Peru, *Dombey* (holotype, P!, photo, US); Mexico, Mt. Orizaba, *Galeotti?*; “Martini-ca,” *Desvaux* (P?).

Acrostichum leptophyllum Fée, Mém. foug. 2: 45. t. 17, f. 1. 1845, not Lam. & DC., 1805. TYPE: Brazil, *Blanchet 548* (holotype, P!).

Elaphoglossum leptophyllum (Fée) Moore, Index fil. 11. 1857.

Stem short- to moderately creeping, 2–3 mm in diameter, scales ovate to (ovate-lanceolate) linear-lanceolate, orange or tan with varying degrees of dark, shiny, sclerotic streaking, ca. 3 mm long, entire or with occasional small, irregular hairlike processes. **Phyllopodia** distinct. **Leaves** spaced 1–8 mm apart, 6–38 cm long, 0.6–1.4 cm broad. **Petiole** $\frac{1}{4}$ – $\frac{1}{2}$ the sterile leaf length, glabrous or with tan, ovate scales. **Lamina** linear-elliptic, apex acute to obtuse, base attenuate. **Veins** obscure, free, ca. 1 mm apart, at 60–70-degree angle. **Hydathodes** lacking. **Lamina scales** sparse, minute, stellate hairs or dots on abaxial surface, rare on adaxial surface. **Fertile leaves** longer than the sterile, petiole ($\frac{1}{3}$) $\frac{1}{2}$ – $\frac{2}{3}$ the leaf length, the lamina similar to the sterile in size and shape; intersporangial scales lacking.

Terrestrial in wet forests, cliffs, grassy slopes, and roadsides, (800–)2400–3700 m, Piura to Amazonas, south to Huancavelica and Puno.

Costa Rica; Panama; Jamaica; Hispaniola; Venezuela and Colombia to Bolivia.

Piura: Huancabamba, Mitopampa (Huancabamba-Cuello del Indio), *Sagástegui* 8238 (F, HUT, NY, UC). **Lambayeque:** Ferreñafe, 7 km NW of Incahuasi near Cerro Punamachay on trail to Laguna Hualtaco, *Dillon & Skillman* 4116A (F). **Cajamarca:** Contumazá, Tambo La Lima (Cascas-Contumazá), *López M.* 9029 (F, GH, UC). **Amazonas:** Chachapoyas, Cerros Calla Calla, 45 km above Balsas, road to Leimebamba, *Hutchison & Wright* 5806 (F, GH, NY, UC). **La Libertad:** Trujillo, Cerro Campana, *Sagástegui* 12917 (F). **San Martín:** Mariscal Cáceres, NW corner of Río Abiseo Nat. Park, *Young & León* 4685 (USM). **Ancash:** Huaráz, Huascarán Nat. Park, Quebrada Shallap, *D. Smith et al.* 10777 (NY). **Huánuco:** Mito, *Bryan* 369 (F). **Lima:** San Bartolome, Bosque de Zarate, Huarochirí, *León* 907 (F, NY). **Pasco:** Border Prov. Oxapampa and Pasco, San Cotardo, *van der Werff et al.* 8526 (UC). **Junín:** Huancayo, *Kunkel* 441 (GH). **Huancavelica:** Tayacaja, Quebrada SE of Salcabamba, *Stork & Horton* 10312 (F). **Ayacucho:** Pampalca, between Huanta & Apurímac, *Killip & Smith* 23267 (NY). **Cuzco:** "Pillahuata," Cerro de Cusilluyoc, *Pennell* 14112 (GH, NY, US). **Puno:** Sandia, S of Limbani, *Metcalf* 30437 (UC, US).

The following specimens are flocculose abaxially, with sparse, dissected scales resembling tufts of wool. They occur at 1000–2900 m, are on limestone or epiphytic.

Cajamarca: 25 km E of Cajamarca, *Dillon et al.* 2892 (F). **Pasco:** Oxapampa, Canyon de Huancabamba, fundo La Esperanza, *León* 619 (F). **Cuzco:** La Convención, between Santa Teresa and Chaulay, *Núñez & Motocanchi* 8789 (MO).

Some specimens are larger than the usual, with longer petiole (ca. $\frac{1}{2}$ the leaf length), wider, obtuse lamina, and nearly naked stem. They may represent *E. affine* (Mart. & Gal.) Moore. These are:

Cajamarca: Contumazá, Pampa de la Sal, *Sagástegui* 10743 (F, NY). **Ancash:** Carhuaz, Huascarán Nat. Park, Quebrada Ishinca, *Smith & Buddinsiek* 11258 (NY).

68. *Elaphoglossum moyeri* Mickel, *sp. nov.*

Ab *E. papilloso* lamina anguste elliptica necnon stipite gracili diversum.

Named for Dr. Arden Moyer, who is a volunteer in my office, helping with curatorial and research projects.

Stem compact, ca. 4 mm in diameter, scales linear-lanceolate, lustrous, dark red-brown, very indurated, entire, ca. 1 mm long. **Leaves** approximate, 22–23 cm long, 1.8–2.5 cm broad. **Petiole** about $\frac{1}{5}$ the leaf length, glabrous. **Lamina** narrowly elliptic, chartaceous, apex long-acuminate, base

narrowly cuneate. **Veins** evident, 1 mm apart, at ca. 70-degree angle. **Hydathodes** present but indistinct. **Lamina scales** abaxially linear, sclerotic, dark red-brown, ca. 1 mm long, sparse along abaxial costa at maturity, younger leaves with scales scattered on both surfaces. **Fertile leaves** about equal to or slightly shorter than the sterile, petiole $\frac{1}{2}$ – $\frac{3}{5}$ the leaf length, lamina narrowly elliptic but narrower than the sterile, 11–17 mm broad; intersporangial scales lacking.

TYPE—Peru, Pasco, Oxapampa, San Alberto, Cordillera de Yanachaga, *van der Werff et al.* 8429 (holotype, UC!; isotype, MO!).

Endemic. Epiphytic in cloud forest, 2300–2500 m, Pasco.

Thus far known only from the type collection.

69. *Elaphoglossum muscosum* (Sw.) Moore, Index fil. 12. 1857.

Acrostichum muscosum Sw., Prodr. 128. 1788. **TYPE:** Jamaica, Swartz (holotype, s; isotype, B, Herb. Willd. 19523; photo, GH of B).

Stem compact, to 12 mm in diameter, scales linear, reddish orange, to 13 mm long, with short teeth. **Phyllopodia** inconspicuous, hidden by scales. **Leaves** approximate, 11–22 cm long, 2.1–2.5 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{2}{5}$ the leaf length, scales linear, light orange, erose-denticulate, to 6 mm long, spreading. **Lamina** narrowly elliptic, subcoriaceous, apex obtuse, base broadly cuneate to rounded. **Veins** obscure, ca. 1 mm apart, at ca. 60-degree angle. **Hydathodes** lacking. **Lamina scales** of adaxial surface white, or with slightly darker centers, peltate, ovate-lanceolate, long-toothed, abundant, on abaxial surface longer, darker orange, less peltate. **Fertile leaves** longer than the sterile, petiole ca. $\frac{3}{5}$ the leaf length, lamina slightly narrower than the sterile; intersporangial scales ciliate.

Epiphytic in wet forests, 3000 m, Huancavelica, Cuzco.

Mexico to Panama; West Indies; Colombia to Peru.

This is distinguished by the erose-denticulate scales on the petiole and costa, and the concolorous lamina scales.

Huancavelica: Tayacaja, Ampurco, *Tovar* 3772 (GH). **Cuzco:** Machu Picchu, *Soukup* "177", March 1936 (F).

70. *Elaphoglossum nastukiae* Mickel, *sp. nov.*

Ab *E. huacsaro* lamina adaxialiter densius squamosa abaxialiter glandulosa et squamulis reductis ciliolatis ob-
sita discriminatum.

Named for Ruth Nastuk, who is a volunteer in my office and the New York Botanical Garden greenhouses.

Stem short-creeping, ca. 5 mm in diameter, scales linear-lanceolate, lustrous, black, sclerotic, subentire, 2–3 mm long, with sparse, very short teeth. **Phyllopodia** present. **Leaves** slightly apart, 18–23 cm long, 1.0–1.5 cm broad. **Petiole** ca. $\frac{1}{3}$ the sterile leaf length, scales subentire, spreading, 2–3 mm long, dark or orange with dark tip, distally smaller and paler, also with very small, roundish, pale, appressed scales. **Lamina** narrowly elliptic, chartaceous, apex acuminate, base narrowly cuneate. **Veins** evident, ca. 0.8 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** adaxially abundant, touching but not much overlapping, ovate or round, entire to erose, 0.5–1.5 mm long; abaxially with reduced, scattered, fimbriate scales and resin dots, costal scales as on petiole. **Fertile leaves** longer than the sterile, petiole ca. $\frac{3}{5}$ the leaf length, lamina slightly narrower than the sterile; intersporangial scales lacking.

TYPE—Peru, Huancavelica, Tayacaja, quebrada SE of Salcabamba, *Stork & Horton 10312* (holotype, UC!).

Endemic. Terrestrial “in mossy loam under forest cover,” 3300 m, Huancavelica.

Thus far known only from the type.

71. *Elaphoglossum nidiformis* Mickel, *sp. nov.*

Rhizomate valido squamis aurantiacis induto et fronde sessile oblanceolato chartacea nuda distincta.

Stem compact, horizontal, ca. 10 mm in diameter, scales ovate-lanceolate, lustrous, orange, 4–6 mm long, subentire with sparse irregular teeth. **Phyllopodia** evident. **Leaves** fasciculate, 30–37 cm long, 4.0–5.0 cm broad. **Petiole** essentially lacking, to 1 cm long, with orange, appressed to spreading scales, 4–5 mm long, subentire. **Lamina** oblanceolate, chartaceous, apex acute, base narrowly cuneate. **Veins** evident, about 1.5 mm apart, at 70-degree angle. **Hydathodes** lacking. **Lamina scales** lacking, but abaxial surface with scattered, minute, stellate trichomidia. **Fertile leaves** longer than the

sterile, petiole $\frac{1}{2}$ the fertile leaf length, lamina narrowly oblanceolate; intersporangial scales lacking.

TYPE—Peru, Madre de Dios, Manú, Cerro de Pantiacolla, Río Palotoa, 10–15 km NNW of Shintuya, *Foster 10891* (holotype, F!).

Endemic. Epiphytic in wet forests, 700–1000 m, Madre de Dios.

Thus far known only from the type.

72. *Elaphoglossum nigrescens* (Hooker) Diels, *Nat. Pflanzenfam.* 1(4): 332. 1899.

Acrostichum nigrescens Hooker, *Sp. fil.* 5: 214. 1864.
TYPE: Venezuela (as British Guiana), Roraima, *Schomburgk* (holotype, K!).

Stem short-creeping, 1–2 mm in diameter, scales lacking, stem glutinous. **Phyllopodia** present, short, ca. 5 mm long. **Leaves** approximate, 19–40 cm long, 1.1–2.0 cm broad. **Petiole** $\frac{1}{30}$ – $\frac{1}{5}$ the sterile leaf length, glabrous. **Lamina** linear-elliptic, membranous to chartaceous, apex acute to acuminate, base attenuate. **Veins** evident, free, 1.5–2 mm apart, occasionally elongate laterally at tips but not joining, at ca. 60 degree angle. **Hydathodes** lacking. **Lamina scales** essentially lacking except on costa and margin, surface glandular-punctate abaxially, costa scales occasional, ovate, brown, under 1 mm long, margin scales occasional, dissected, brown, under 1 mm long. **Fertile leaves** about equal to the sterile in length, petiole $\frac{2}{3}$ the leaf length, lamina linear, 3–5 mm broad; intersporangial scales lacking.

Epiphytic in wet forests, 100–1200 m, Loreto, Junín, Madre de Dios.

Venezuela; Colombia; Ecuador; Peru.

Loreto: Prov. Maynas, Dist. Napo, bank of Río Santa María, *King 452* (F, NY). **Junín**: Satipo, Gran Pajonal, trail to Pajonal Panquerete, S of Chequitavo, *D. Smith 5133* (NY, UC). **Madre de Dios**: Manú, Cerro de Pantiacolla, *Foster 10792* (F, GH).

73. *Elaphoglossum nivosum* (Kunze) Mickel, *comb. nov.*

Acrostichum nivosum Kunze, *Bot. Zeit.* (Berlin) 1845: 281. **TYPE**: Venezuela, Caracas, *Moritz* (holotype, LZ, destroyed).

Stem compact, 4–8 mm in diameter, scales linear-lanceolate, lustrous, sclerotic, black, ca. 5 mm

long, entire. **Phyllopodia** inconspicuous. **Leaves** fasciculate (7–)17–30 cm long, 1.2–2.2 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{1}{2}$ the leaf length, scales with dark center, pale margin, dense, imbricate, ascending, 2–3 mm long, erose. **Lamina** narrowly elliptic, chartaceous, apex acute to obtuse, base cuneate. **Veins** obscure, free, 1 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** abaxially densely imbricate, reddish-orange, erose to short ciliodenticulate, 2–3 mm long, costal scales dark, sclerotic centered, adaxially white, round to ovate, peltate, scattered. **Fertile leaves** longer than the sterile, petiole $\frac{2}{3}$ the fertile leaf length, lamina narrow, ca. 1.2 cm broad, costal scales black-centered, cilia longer than the scale body width; intersporangial scales lacking.

Terrestrial on rocky slopes and clay banks, 2600–3900 m, Cajamarca, La Libertad, Ayacucho, Junín.

Venezuela; Ecuador; Peru; Bolivia.

Cajamarca: Prov. Cajamarca, Cerro Tunazorco, Sunchubamba, *Cabanillas et al.*, 26 Aug 1974 (us). Contumazá, La Herilla Gumango, *Sagástegui et al.* 6461 (NY) 9676 (uc). **La Libertad:** Santiago de Chuco, Cachicadán, *Stork & Horton* 9951 (F, us). Bolívar, Chomparen, *López & Sagástegui* 3203 (GH). **Ayacucho:** Ccarrapa, between Huanta & Río Apurímac, *Killip & Smith* 22284 (NY). **Junín:** Tarma, Palca, 2 km beyond Yanamayo, Tarma to La Merced road, *Saunders* 707 (F, GH). Paucartambo, *Woytkowski* 6688 (us), 6690 (us).

74. **Elaphoglossum obovatum** Mickel, *Brittonia* 39: 322. 1987. TYPE: Venezuela, Amazonas, Cerro Yapacana, *Steyermark & Bunting* 103199 (holotype, us!; isotype, NY!).

Stem compact, 3–4 mm in diameter, scales linear, orange, lustrous, 3–4 mm long, margin entire or with a few long hairlike processes. **Phyllopodia** present. **Leaves** fasciculate, 6–11 cm long, 2–4 cm broad. **Petiole** $\frac{1}{2}$ – $\frac{2}{3}$ the sterile leaf length, the scales scattered, appressed to spreading, linear, deeply lacerate, orange to brown, lustrous, 2–4 mm long. **Lamina** obovate, coriaceous, apex broadly rounded, base cuneate. **Veins** obscure, free, 1 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** abaxially scattered, concentrated at margin, skeletonized, orange to brown, dull, ca. 2 mm long, adaxially subglabrous. **Fertile leaves** shorter (about $\frac{1}{2}$) than the sterile, petiole about $\frac{1}{2}$ the fertile leaf length, the lamina ovate, apex obtuse, base

rounded, narrower than the sterile lamina; intersporangial scales lacking.

Epiphytic in wet forests, 130–140 m, Loreto, Venezuela; Peru.

The fertile leaf in the only fertile Peru specimen (*Rimachi* 7613) is slightly different from that of the Venezuelan material; it is ovate with rounded base rather than cuneate.

Loreto: Maynas, Dist. Iquitos, Carretera de Santo Tomas, *Rimachi* Y. 7613 (NY). Prov. Requena, Jenaro Herrera, *van der Werff et al.* 10029 (uc). Prov. Maynas, Mishana, *van der Werff* 10177 (uc).

75. **Elaphoglossum obtusum** Mickel, *sp. nov.*

Ab *E. ornato* laminae costa ac margine squamis denticulatis provisus recognita.

Stem compact, horizontal, ca. 4 mm in diameter, scales linear-lanceolate, lustrous, orange, 4–7 mm long, with hairlike teeth. **Phyllopodia** ca. 4 mm long, but not dark. **Leaves** fasciculate, 15–23 cm long, 3.2–5.5 cm broad. **Petiole** $\frac{1}{8}$ – $\frac{1}{6}$ the sterile leaf length, with orange scales widely spreading, 3–7 mm long, 1–1.8 mm broad, with long, hairlike teeth. **Lamina** oblanceolate, chartaceous, apex broadly obtuse, base nearly to broadly cuneate. **Veins** evident, free, 1–1.5 mm apart, ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** as on petiole but narrower, on lower surface limited to costa and margin, remaining surface completely naked, upper surface with scales scattered. **Fertile leaves** about equal the sterile in length, petiole $\frac{2}{3}$ the leaf length, lamina much narrower, ca. 1.3 cm broad, narrowly elliptic, apex obtuse, base cuneate; intersporangial scales lacking.

TYPE—Peru, San Martín, Palo Blanco, al oeste del Puente, Mariscal Cáceres, Tocache Nuevo, *J. Schunke* V. 5757 (holotype, NY!; isotype, F!).

Endemic. Epiphytic in wet forests, 700–800 m, San Martín.

This resembles Venezuelan material cited as *E. ornatum* (Kuhn) Christ (Smith, p. 99) in the dentate scales on costa and margin, the remaining lamina naked, and the oblanceolate lamina. However, the Venezuelan plant narrows to an acute apex rather than being broadly obtuse. The cited Venezuelan material is probably not *E. ornatum*, which differs, according to the original description, in the size and form of the lamina and the laminar scales.

76. *Elaphoglossum oculatum* Mickel, *sp. nov.*

Ab affini *E. muscoso* lamina utraque facie nuda, costa abaxialiter squamis parvis rotundis albis nigro-oculatis ciliolatis induta, laminaeque margine squamis imbricatis dentatis albis ciliata praestans.

Stem compact, ca. 5 mm in diameter, scales linear-lanceolate, maroon to black, 5–8 mm long, toothed. **Phyllopodia** present, hidden under scales. **Leaves** approximate, 18–31 cm long, 1.8–3.9 cm broad. **Petiole** $\frac{1}{4}$ – $\frac{2}{5}$ the sterile leaf length, with scales ovate-lanceolate, erose-denticulate, 2–3 mm long, black or dark orange with white margin, smaller scales appressed. **Veins** evident, 1 mm apart, at 65–70-degree angle. **Hydathodes** lacking. **Lamina scales** lacking on surface abaxially, with marginal scales cilio-denticulate, ca. 1 mm long, adaxial surface glabrous or with greatly reduced scales or nearly substellate trichomes, costal scales round, black with white margins, cilio-denticulate, 0.5–1 mm long. **Fertile leaves** longer than the sterile, petiole about $\frac{1}{2}$ the leaf length, lamina slightly narrower than the sterile; intersporangial scales abundant, ciliate.

TYPE—Peru, Piura, Huancabamba, above Huancabamba, road to Canchaque, *Hutchison 1629* (holotype, UCI; isotype, GH!).

Endemic. Epiphytic in wet forests, 1900–3100 m, Piura, Junín, Cuzco.

Junin: Tarma, Agua Dulce, *Woytkowski 35433* (MO, UC). **Cuzco:** Machu Picchu, Soukup "176", March 1936 (F).

77. *Elaphoglossum odontolepis* Mickel, *sp. nov.*

Rhizomate longe repenti laminaeque coriacea secus costam squamis obscuris hinc inde dentatis provisa praestans.

Stem long-creeping, ca. 3 mm in diameter, scales linear-lanceolate, lustrous, orange to black-brown, 3–5 mm long, hastate, with occasional hairlike processes. **Phyllopodia** present. **Leaves** 1–3 cm apart, 32–50 cm long, 3.4–5.5 cm broad. **Petiole** ca. $\frac{1}{3}$ the sterile leaf length, glabrous. **Lamina** narrowly oblanceolate to narrowly lanceolate, coriaceous, apex acuminate, base attenuate. **Veins** obscure, free, 1 mm apart, at ca. 80-degree angle. **Hydathodes** lacking. **Lamina scales** abaxially scattered, especially near lamina base and along costa, 2–3 mm long, hastate, black, with irregular pro-

cesses, and with black punctae, also adaxially black-punctate and stellate-punctate. **Fertile leaves** nearly equalling the sterile in length, petiole about $\frac{1}{3}$ the leaf length, lamina nearly equal to the sterile in size and shape; intersporangial scales scattered, black, sclerotic, with irregular teeth.

TYPE—Peru, Cuzco, Urubamba, Machu Picchu, E of Phuyupatamarca overlooking Urubamba River and Winay Huayna, *Peyton & Peyton 356* (holotype, MO!).

Endemic. Epiphytic in wet forests, 3200–4000 m, San Martín, Cuzco.

San Martín: Mariscal Cáceres, NW corner of Río Abiseo Nat. Park, Chochos, forest on edge of Laguna de Chochos, *Young & León 4866* (USM). **Cuzco:** La Convención, Huayopata 7 km from Incatambo, S side of Lucumayo River, *Peyton & Peyton 958* (GH). 8 km SE of Machu Picchu, *Whiteman*, Aug 1980 (NY).

78. *Elaphoglossum oöphyllum* Mickel, *sp. nov.*

Rhizoma longe repens et lamina magna ovato-lanceolata squamis minutis nigris conspersa diagnoscenda.

Stem long creeping, ca. 3 mm in diameter, scales linear-lanceolate, dull orange-tan, 3–4 mm long, with hairlike processes. **Phyllopodia** present. **Leaves** 5–10 mm apart, 23–32 cm long, 5.5–6.6 cm broad. **Petiole** about $\frac{1}{2}$ the sterile leaf length, scales black, linear-lanceolate, appressed to spreading, 2–4 mm long, with irregular hairlike processes. **Lamina** ovate to ovate-lanceolate, chartaceous, apex acute, base rounded. **Veins** obscure, free, 1 mm apart, at 70–80-degree angle. **Hydathodes** lacking. **Lamina scales** abaxially reduced to orange stellate trichomidia, along costa scales black, linear-lanceolate, with irregular hairlike processes, adaxially glabrous. **Fertile leaves** longer than the sterile, petiole $\frac{2}{3}$ – $\frac{3}{4}$ the fertile leaf length, lamina narrowly elliptic; intersporangial scales lacking.

TYPE—Peru, Cuzco, La Convención, Ichiquia-to, *Vargas C. 22337* (holotype, GH!, isotype, GH!).

Endemic. Epiphytic(?) in wet forests, 1000 m, Cuzco.

Thus far known only from the type collection.

79. *Elaphoglossum orbignyanum* (Fée) Moore, Index fil. xvi. 1857.

Acrostichum orbignyianum Fée, Mém. foug. 2: 56. t. 13, f. 2. 1845. TYPE: Bolivia, Yungas, Chupe, Marancel del Monte, *Orbigny 138* (holotype, P!).

Stem compact, 6–12 mm in diameter, scales lanceolate-deltate, black, very indurated, lustrous, ca. 5 mm long, with weak, tan cilia along margin. **Phyllopodia** present but hidden by scales. **Leaves** approximate, (30–)75–100 cm long, 4–7 cm broad. **Petiole** about $\frac{2}{3}$ the leaf length, scales dense, appressed to ascending, lanceolate to linear-lanceolate, ciliate, orange, some red-centered, to 7 mm long at petiole base, but mostly 2–3 mm long. **Lamina** elliptic, chartaceous, apex gradually to abruptly acuminate, base broadly cuneate. **Veins** ca. 1 mm apart, at 80-degree angle, obscured by scales. **Hydathodes** lacking. **Lamina scales** adaxially barely touching one another, lanceolate to ovate-lanceolate, 1–3 mm long, orange, ciliate, abaxially densely imbricate, ciliate, orange, often red-centered, 1–3 mm long, costal scales lanceolate to linear-lanceolate, 2–4 mm long, red-centered, appressed. **Fertile leaves** nearly equalling the sterile in length, petiole $\frac{3}{5}$ the leaf length, lamina elliptic, narrower than the sterile; intersporangial scales lacking.

Terrestrial in wet forests, (680–)1350–3200 m, San Martín, Junín, Cuzco.

Venezuela; Colombia; Peru; Bolivia.

This differs from *E. hickenii* in that the latter has stem scales nonciliate, petiole and costal scales erose to short-ciliate, and lamina narrower (2.5–4.1 cm).

San Martín: San Roque, *Ll. Williams 7418* (US). **Junín:** Colonia Perené, *Killip & Smith 24954* (NY, UC, US). Carapata, above Huacapistana, *Killip & Smith 24413* (NY). Chanchamayo Valley, *C. Schunke 134, 135* (US). Tarma, Agua Dulce, *Woytkowski 35438* (MO, UC). **Cuzco:** Machu Picchu, *Coronado 141* (UC). Prov. Cuzco, Ribera del Río Urubamba, *Angulo 1773* (GH). Machu Picchu, *Soukup "175"* (F). San Miguel, Urubamba Valley, *Cook & Gilbert 1159* (US).

80. *Elaphoglossum oxyglossum* Mickel, *sp. nov.*

Ab *E. zebrino*, cui arcte affinis, rhizomate compacto et laminae squamis brevioribus abstat.

Stem short-creeping, ca. 3 mm in diameter, with white patches on stem and petiole bases, scales lanceolate, maroon-black, lustrous, 0.5–1 mm long, entire. **Phyllopodia** lacking. **Leaves** to ca. 2 mm

apart, 55–65 cm long, 2.0–2.5 cm broad. **Petiole** about $\frac{1}{2}$ the sterile leaf length, with sparse linear-lanceolate, appressed, blackish scales ca. 1 mm long. **Lamina** linear-elliptic, chartaceous, apex acuminate, base cuneate. **Veins** evident, free, ca. 1.5 mm apart, at 60–70-degree angle. **Hydathodes** distinct. **Lamina scales** lacking adaxially except for sparse, tan ones 1.5 mm long, along margin near hydathodes, abaxially sparse, small, lanceolate, dark to pale, 0.5–1 mm long on costa and lamina. **Fertile leaves** slightly shorter than the sterile, petiole $\frac{3}{4}$ the fertile leaf length, lamina apex acute, base cuneate, scales 1–1.5 mm long, maroon on costa; intersporangial scales pale.

TYPE—Peru, Pasco, Oxapampa, road from Oxapampa to Villa Rica, *Skog et al. 5099* (holotype, US!).

Endemic. Epiphytic in wet forest, ca. 1500–2150(–3400) m, San Martín, Huánuco, Pasco.

San Martín: Mariscal Cáceres, *Young 3783* (USM). **Huánuco:** Huacachi, near Muña, *Macbride 4129* (F, US). Muña, *Bryan 538* (F). Cushi, *Macbride 4818* (F, US).

81. *Elaphoglossum pachyphyllum* (Kunze) C. Chr., Index fil. 312. 1905.

Acrostichum pachyphyllum Kunze, Linnaea 9: 26. 1834. TYPE: Peru, Pampayacu, *Poeppig*, July 1829 (holotype, LZ, destroyed; isotype, P!; photos, F!, NY!).

Hymenodium kunzeanum Fée, Mém. foug. 2: 90, t. 58. 1845, based on *Acrostichum pachyphyllum* Kunze and with the same type.

Stem short-creeping, (3) 6–10 mm in diameter, scales linear-lanceolate, dull brown, 10–20 mm long, with hairlike processes. **Phyllopodia** present. **Leaves** 1–2.5 cm distant, 50–100 cm long, 0.9–1.5 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{1}{2}$ the leaf length, scales at base scattered, orange, spreading, 5–10 mm long, with hairlike processes, scales distally reduced, obscure, finely skeletonized, appressed. **Lamina** broadly lanceolate, coriaceous, apex acute to acuminate, base truncate to broadly cuneate. **Veins** barely visible, anastomosing, 1 mm apart, at 80-degree angle. **Hydathodes** lacking. **Lamina scales** lacking except for finely skeletonized, orange appressed ones along costa. **Fertile leaves** shorter than the sterile, petiole $\frac{1}{2}$ the leaf length, the lamina similar in shape to the sterile; intersporangial scales lacking.

Endemic. Epiphytic in wet forests, 680–2700 m, Amazonas, San Martín, Huánuco, Junín, Cuzco, Madre de Dios.

Amazonas: 12–18 km E of La Peca in Serranía de Bagua, *Gentry et al.* 22886 (MO). **San Martín:** Mariscal Cáceres, Río Abiseo Nat. Park, *Young & León* 5021 (USM). **Huánuco:** Pampayacu, *Kanehira* 126 (GH). **Junín:** Chanchamayo Valley, *C. Schunke* 175 (F). La Merced, Hacienda Schunke, *Macbride* 5773 (F). Colonia Perené, *Killip & Smith* 24952 (F, GH, NY, US). **Cuzco:** Prov. Paucartambo, Valle de Pillahuata, *Herrera* 1615 (US). **Madre de Dios:** Manú, Cerro de Pantiacolla, Río Palotoa 10–15 km NNW of Shintuya, *Foster* 10889A (F, GH).

82. *Elaphoglossum pachyrrhizum* Mickel, *sp. nov.*

Rhizomate valido longe repenti, lamina lineari obscure venosa necnon laminae squamis lanceolatis badiis ab affinibus remota.

Stem long-creeping, to 4 mm in diameter, scales tan, lanceolate, 3–5 mm long, entire. **Phyllopodia** lacking. **Leaves** distant, 18–30 cm long, 1.3–1.7 cm broad. **Petiole** $\frac{1}{4}$ – $\frac{1}{3}$ the leaf length, scales imbricate, lanceolate, tan to brown, 1–2 mm long, entire, appressed to somewhat spreading. **Lamina** linear-elliptic, apex acuminate, base cuneate. **Veins** indistinct, free, 1–2 mm apart, at 50–70-degree angle. **Hydathodes** evident. **Lamina scales** brown, lustrous, lanceolate, 1–2 mm long, mostly along costa, deciduous on abaxial surface but with minute punctae or stellate trichomidia, those of the margin entire, ca. 1 mm long, mostly appressed. **Fertile leaves** shorter than the sterile, petiole about $\frac{2}{3}$ the fertile leaf length, lamina apex acute, base subtruncate or rounded; intersporangial scales lacking.

TYPE—Peru, Amazonas, Bagua, Cordillera Colón, SE of La Peca, *Barbour* 4111 (holotype, MO!). Endemic. Terrestrial in wet forests, 2350–2450 m, Amazonas.

Thus far known only from the type.

83. *Elaphoglossum paleaceum* (Hooker & Grev.) Sledge, *Bull. Brit. Mus. (Nat. Hist.) Bot.* 4(2): 95. 1967. **Figure 25a–b.**

Acrostichum paleaceum Hooker & Grev., *Icon. fil.* 2: t. 235, *Alph. Index et Syst. Index.* 1831. **TYPE:** the original figure, drawn from Madeira, *Lowe* (not located).

Acrostichum vestitum Hooker & Grev., *Icon. fil.* 2: text for t. 235. 1831, not Schlecht. & Cham. 1830.

Stem compact, horizontal, 2–6 mm in diameter, scales linear-lanceolate, brown to black and opaque, lustrous, ca. 5 mm long, margin with long, stiff, hairlike teeth. **Phyllopodia** distinct. **Leaves** approximate, 10–28 cm long, 0.8–1.6 cm broad. **Petiole** $\frac{1}{4}$ – $\frac{1}{3}$ the sterile leaf length, densely to sparsely clothed with spreading, black or orange scales, these often with black teeth and tip, to 3 mm long. **Lamina** narrowly elliptic, apex acuminate, base broadly to narrowly cuneate. **Veins** obscure, free, ca. 1 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** abundant, overlapping but loose, lanceolate, ca. 2 mm long, long hair-toothed, usually those of the petiole and costa dark. **Fertile leaves** shorter than the sterile, to 20 cm long, petiole $\frac{1}{2}$ – $\frac{2}{3}$ the fertile leaf length, but with same lamina shape or more obtuse; intersporangial scales lacking.

Epiphytic and terrestrial on rocky banks in wet forests, 950–3950 m, Piura to Amazonas, south to Cuzco and Puno.

Mexico to Panama; West Indies; Venezuela and Colombia to Bolivia and Brazil; Azores and Madeira.

There is considerable variation in this species, and I take a rather broad view of it here. Most of the specimens agree with the measurements cited above. These may match *E. plicatum* (Cav.) C. Chr., in which case that is the correct name, but closer study is needed. Plants with larger, broader leaves (26–61 cm long, 2.4–4.1 cm broad), often with a caudate apex (examples cited below with asterisk), may be *E. molle* (Sodirol) C. Chr. (Type from Ecuador; isotype, s!).

Piura: Huancabamba, above Canchaque on the road to Huancabamba, *Hutchison* 1648 (GH). **Cajamarca:** Colosay, *Woytkowski* 7020 (MO). Hualgayoc, *Soukup-Carmona* Fa5234* (US). **Amazonas:** Chachapoyas, Cerros Calla Calla, 19 km above Leimebamba on road to Balsas, *Hutchison & Wright* 5571 (F, GH, NY, UC, US). **San Martín:** Mariscal Cáceres, Chochos, NW corner Río Abiseo Nat. Park, *Young* 3592* (NY). Rioja, Pedro Ruíz-Moyobamba road, *D. Smith* 4355* (UC). **Huánuco:** Río Lluapichis watershed on the ascent of Cerros del Sira, *Dudley* 13340A* (GH). Tambo de Vaca, *Bryan* 649* (F, GH). Muña, *Macbride* 4301* (US). **Pasco:** Oxapampa, Abalos Mellizos, *Skog et al.* 5046a (US). **Cuzco:** Urubamba, ruins of Machu Picchu, *Tryon & Tryon* 5397 (GH). Cordillera Vilcabamba, 28 km NE of Hda. Luisiana and Apurímac River, *Dudley* 11188 (US). Montana de Colca, Valle de Lares, *Bues* 1794 (US). **Puno:** Carabaya, valle de San Gabán, Hda. Quillabamba a Pte. Arica, *Vargas C.* 18918* (GH).

84. **Elaphoglossum palorense** Rosenst., Repert. Spec. Nov. Regni Veg. 7: 149. 1909. TYPE: Ecuador, Cordillera oriental ad flumen Palora, *Rimbach 66* (holotype, s!).

Stem short-creeping, ca. 4 mm in diameter, scales linear-lanceolate, lustrous, castaneous, 2–3 mm long, entire. **Phyllopodia** lacking. **Leaves** approximate to only slightly apart, (15–)35–42 cm long, 0.8–1.1 cm broad. **Petiole** ca. $\frac{1}{10}$ the leaf length, scales linear, orange-tan, 2–3 mm long, ca. 0.4 mm broad, patent. **Lamina** linear, chartaceous, apex acuminate, base long-attenuate, margin entire to barely crenulate. **Veins** evident, 1.5–2 mm apart, at ca. 65-degree angle. **Hydathodes** present but indistinct. **Lamina scales** linear, orange-tan, scattered on abaxial costa, to 1 mm long, very sparse on abaxial surface and margin, to 0.5 mm long. **Fertile leaves** shorter than the sterile, petiole $\frac{3}{4}$ the leaf length, lamina narrowly elliptic, apex apiculate, base broadly cuneate, 0.9–1.1 cm broad; intersporangial scales lacking.

Epiphytic in wet forests, 1450–1800 m, San Martín, Huánuco.

Ecuador; Peru.

Similar to *E. eximium* except: petiole and lamina scales not subulate and dark, but tan-orange, linear, not punctate abaxially; fertile leaf more narrowly elliptic, the lamina 6–7.5 cm long, 0.9–1.1 cm broad, and with cuneate base.

San Martín: Rioja, Venceremos, *D. Smith 4434* (F). **Huánuco:** SW slope of Río LLullapichis watershed on the ascent of Cerros del Sira, *Dudley 13198* (GH).

85. **Elaphoglossum papillosum** (Baker) Christ, Monogr. Elaphoglossum. 130. 1899.

Acrostichum papillosum Baker, J. Bot. 15: 167. 1877. TYPE: Ecuador, Andes of Quito, *Sodirol* (holotype, K).

Stem short-creeping, 4 mm in diameter, scales black, lanceolate-deltate, 1–2 mm long. **Phyllopodia** lacking. **Leaves** approximate, 34–38 cm long, 5.2–5.7 cm broad. **Petiole** $\frac{1}{2}$ the sterile leaf length, scales scattered, appressed, black-brown, lanceolate, to 1 mm long. **Lamina** elliptic, chartaceous, apex acuminate, base cuneate. **Veins** distinct, free, ca. 1.5 mm apart, at ca. 70-degree angle. **Hydathodes** evident. **Lamina scales** on both surfaces brown-black, lanceolate, 0.5 mm long, scattered adaxially, sparse abaxially. **Fertile leaves** longer,

lamina oblanceolate, apex acute, base attenuate, petiole $\frac{3}{5}$ the fertile leaf length; intersporangial scales lacking.

Epiphytic or terrestrial in wet forests, 2650–2750 m, San Martín.

Costa Rica; Panama; Venezuela and Colombia to Bolivia.

Similar to *E. castaneum* except: petiole of fertile leaf gray-green (dried), similar to those of sterile leaves, not black; laminar scales and petiole scales short, lanceolate, dark, not subulate and toothed; stem scales black, not castaneous.

San Martín: Prov. Mariscal Cáceres, Río Abiseo Nat. Park, *Young & León 5007* (USM).

86. **Elaphoglossum pascoense** R. Tryon. Amer. Fern J. 74. 108. 1984. TYPE: Peru, Oxapampa, road between Oxapampa and Villa Rica, *Foster 9127* (holotype, GH!; isotypes, MO!, NY!).

Stem long-creeping, 5–7 mm in diameter, scales dark, appressed, resinous, dark brown, entire, 1–2 mm long, sparse except at apex. **Phyllopodia** lacking. **Leaves** 28–54 cm long, 6.5–12 cm broad. **Petioles** distant, long-decurrent on the stem, $\frac{1}{2}$ – $\frac{2}{3}$ the sterile leaf length, scales abundant, appressed, tan, ovate to linear-lanceolate, finely ciliolate. **Lamina** oblong-ovate, apex caudate, base deeply cordate to sagittate. **Veins** distinct, free, ca. 2 mm apart, at 75–80-degree angle. **Hydathodes** evident. **Lamina scales** sparse, lanceolate, light brown, denticulate, but broader, more dense, minutely ciliolate, and appressed on costa. **Fertile leaves** equalling the sterile in length, petiole $\frac{3}{4}$ the fertile leaf length, lamina lanceolate, 12 cm long, 2 cm broad, apex acuminate, base truncate; intersporangial scales elongate, brownish, ciliate.

Endemic. Terrestrial in wet forests, 2100–2400 m, Pasco.

Thus far known only from the type collection.

87. **Elaphoglossum patinii** (Baker) Christ, Monogr. Elaphoglossum 58. 1899.

Acrostichum patinii Baker, in Hooker & Baker, Syn. fil. ed. 2: 519. 1874.

SYNTYPES: Andes of New Granada, *Patin* (K); Peru, Cuzco, Pintobamba, *Pearce* (BM; photo, US).

Stem short-creeping, 2–3 mm in diameter, scales tan-orange, linear-lanceolate, spreading, dull, 6–8 mm long, 1–1.5 mm wide, entire. **Phyllopodia** present, hidden among scales. **Leaves** 1–1.5 cm apart, 25–28 cm long, 1.7–2.0 cm broad. **Petiole** $\frac{1}{5}$ – $\frac{1}{10}$ the leaf length, glabrous. **Lamina** linear-elliptic, coriaceous, apex narrowly obtuse, base narrowly cuneate. **Lamina scales** abaxially sparse, black, sclerotic, hastate, ca. 1 mm long, adaxially lacking. **Fertile leaves** shorter than the sterile, petiole $\frac{1}{5}$ the leaf length, lamina broader than the sterile, 2.0–2.4 cm broad, apex narrowly obtuse, base rounded; intersporangial scales lacking.

Epiphytic in wet forests, elevation unknown, Cuzco.

Colombia; Peru.

Possibly distinct from the Colombian syntype, in which case the Patin collection should be designated the lectotype and the Peru specimen re-named. It resembles *E. velongum* in the linear, coriaceous, glabrous lamina and orange stem scales, but *E. patinii* has longer, more spreading stem scales, more slender petiole, and lacks petiole scales.

88. *Elaphoglossum petiolosum* (Desv.) Moore, Index fil. 12. 1857.

Acrostichum petiolosum Desv., Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesamnten Naturk. 5: 309. 1811. TYPE: Peru, *J. de Jussieu* (holotype, P!).

Acrostichum acuminatum Poir. in Lam., Encycl. Suppl. 1: 120, Sept. 1810, (not Willd. 1810). TYPE: Peru, *J. de Jussieu* (holotype, P).

Acrostichum caudatum Hooker, Icon. pl. t. 215. 1840, not Cav. 1802. TYPE: Colombia, Andes, Pilz-hum, *Jameson* (holotype, K!).

Elaphoglossum caudatum (Hooker) Moore, Index fil. 7. 1857.

Elaphoglossum glutinosum Christ. Monogr. Elaphoglossum 120. 1899. TYPE: Andes of Quito, Ecuador, *Spruce* 5614 (isotype, B!).

Stem short-creeping, 3–4 mm in diameter, scales linear, lustrous, red-black, 6–10 mm long, entire or with very sparse teeth (1–2 per scale). **Phyllopodia** distinct. **Leaves** 1–5 mm apart, 15–44 cm long, 1.8–3.0 cm broad. **Petiole** $\frac{1}{2}$ – $\frac{2}{3}$ the sterile leaf length, with orange scales appressed to spreading, 2 mm long, with hairlike teeth, also glandular trichomes, especially at base of petiole. **Lamina** lanceolate to elliptic, subcoriaceous, apex long-cuspidate, base rounded to broadly cuneate. **Veins** evident, free, ca 1 mm apart, at 70–80-degree angle. **Hydathodes** lacking. **Lamina scales** lanceolate,

cilio-denticulate, 1 mm long, scattered on adaxial surface, abaxially glabrous except for glandular dots, costa and margin with scales 2 mm long. **Fertile leaves** nearly equalling the sterile in length, petiole $\frac{2}{3}$ the fertile leaf length, lamina similar to sterile in size and shape, shorter-cuspidate, conduplicate; intersporangial scales lacking.

Epiphytic in wet forests, 3050–3950 m, Amazonas, La Libertad, San Martín, Huánuco, (Junín?), Cuzco.

Colombia to Bolivia.

Amazonas: Chachapoyas, Cerros Calla Calla, 26 km above Leimebamba on road to Balsas, *Hutchison & Wright* 6977 (F, GH, NY, UC, US). Prov. Chachapoyas, S side of Molinopampa–Diosan pass, *Wurdack* 1610 (US). **La Libertad:** Pataz, Puerta del Monte, Paso La Sábana, *López & Sagástegui* 3465 (GH). **San Martín:** Mariscal Cáceres, forest patch above timberline, Puerta del Monte, *Young* 1619 (NY). Mariscal Cáceres, N side of Chochos Valley, NW corner of Río Abiseo Nat. Park, *Young* 3660 (USM). Mariscal Cáceres, small forest patch above timberline, Chochos, *Young* 2281 (NY). Mariscal Cáceres, Puerta del Monte, NW corner of Río Abiseo Nat. Park, *Young & Leon* 4918 (USM). Dist. Huallaga, Valley of Río Apisoncho above Jucusbamba, *Hamilton & Holligan* 504, 300 (K). **Huánuco:** Tambo de Vaca, *Bryan* 653 (F, US). **Cuzco:** Lucumayo Valley, *Cook & Gilbert* 1343 (US). **Department unknown** (probably Junín): Between Arma (Tarma?) & Yanama (Yanano?), *Bingham* 2060 (US).

89. *Elaphoglossum piloselloides* (Presl) Moore, Index fil. 13. 1857. **Figure 25d–e.**

Acrostichum piloselloides Presl. Reliq. haenk. 1: 14, t. 2, f. 1. 1825. TYPE: Hab. in montanis Peruviae, *Haenke* (holotype, PR or PRC).

Stem erect or ascending, ca. 2 mm in diameter, scales linear, orange, entire, 3–6 mm long. **Phyllopodia** lacking. **Leaves** fasciculate, 2–4 (8) cm long, 0.4–1.0 cm broad. **Petiole** slender, usually $\frac{2}{3}$ – $\frac{3}{4}$ the sterile leaf length, moderately clothed with tan to orange, very narrow, subulate scales 2–4 mm long. **Lamina** spatulate, obovate-lanceolate to narrowly elliptic, apex obtuse, base broadly cuneate. **Veins** obscure, free, ca. 1 mm apart, at 40–50-degree angle. **Hydathodes** present but inconspicuous. **Lamina scales** somewhat subulate (slightly rolled at base) tan to dull orange, uniformly and moderately covering the lamina surfaces. **Fertile leaves** equal to or longer than the sterile, more erect, petiole ca. $\frac{4}{5}$ the fertile leaf length, lamina smaller than the sterile, often folded in half, spatulate to nearly round, scales of lamina and upper

petiole dark brown to black, lustrous, scale bases not inrolled but spreading and denticulate; intersporangial scales lacking.

Terrestrial or epipetric, on rock cliffs, open woods, clay banks, dripping cliffs, 750–2600 m, Piura to Cajamarca, south to Huancavelica and Cuzco.

Mexico to Panama; West Indies; Suriname; Venezuela; Colombia to Chile.

This differs slightly from *E. spatulatum* (Bory) Moore of Bourbon Island and Africa and often is placed under that name.

Piura: Huancabamba, just below summit of Abra Porculla Pass, Mesones-Muro Hwy., *Hutchison* 1385 (UC, US). **Lambayeque:** 46 km from Olmos on road to Jaén, *Correll & Smith* P823 (US). **Cajamarca:** Jaén, Granadillas, in Quebrada Granadillas above Tabaconas, 18 km SE Huancabamba, *Fosberg* 27832 (US). **La Libertad:** Otuzco, Huaranchal, *López et al.* 2692 (GH). **Huánuco:** Mito, steep banks on NW slopes, *Macbride* 3281 (F, US). **Pasco:** Oxapampa, Palcazú, *Foster* 10230 (F). **Junín:** Tarma, La Merced road, 46 km from Tarma, *D. Smith & Canne* 5942 (F, UC). **Huancavelica:** Tayacaja, near Salcabamba, *Tovar* 3592 (GH, USM). **Yacuchuco:** Ccarrapa, between Huanta & Río Apurímac, *Killip & Smith* 22431 (NY, US). **Cuzco:** San Miguel, Urubamba Valley, *Cook & Gilbert* 1181 (US).

90. *Elaphoglossum pilosius* Mickel, Brittonia 39: 324. 1987. TYPE: Venezuela, Mérida, trail leading from La Negrita to the Boquerón of the Quebrada de las Canas, *Luteyn* 6139 (holotype, NY!).

Stem compact, ca. 4 mm in diameter, scales linear-lanceolate, dark reddish-brown, lustrous, 6–8 mm long, denticulate. **Phyllopodia** lacking. **Leaves** fasciculate, (6)9–16 cm long, 1.4–2.7 cm broad. **Petiole** $\frac{1}{2}$ – $\frac{2}{3}$ the sterile leaf length, with scales patent, subulate, reddish-brown, lustrous, 2–3 mm long, denticulate, mixed with minute glandular trichomes. **Lamina** lanceolate to ovate-lanceolate or deltate-lanceolate, chartaceous, apex cuspidate, base rounded or truncate. **Veins** evident, free, 1 mm apart, at 60–75-degree angle. **Hydathodes** present. **Lamina scales** scattered, subulate, reddish-brown, lustrous, 2–3 mm long on adaxial surface, costa and margin, 1–1.5 mm long on abaxial surface. **Fertile leaves** longer than the sterile, petiole $\frac{3}{4}$ the fertile leaf length, lamina oblong, apex obtuse, base rounded to truncate, often folded along costa (conduplicate), costal scales dense, subulate, but intersporangial scales lacking.

Terrestrial or epipetric on roadbanks and rocky slopes in grassy shrubland, 2900–4000 m, Cajamarca, Ancash.

Costa Rica; Panama; Venezuela; Colombia to Peru.

Elaphoglossum pilosius appears to be distinct from *E. lindenii* on the basis of its greater pubescence and rounded to truncate lamina base, but more extensive population samples are needed to settle the matter.

Cajamarca: San Miguel, El Tingo, *Sagástegui* 8824 (F). **Ancash:** Yungay, 25 km E of Yungay, *Edwin & J. Schunke* V. 3810 (F, GH, US). Yungay, Huascarán Nat. Park, Quebrada Ranincuray, *D. Smith et al.* 10470b (NY).

91. *Elaphoglossum plumosum* (Fée) Moore, Index fil. 364. 1862.

Acrostichum plumosum Fée, Mém. foug. 2: 54. t. 20, f. 1. 1845. TYPE: Guyana (as French Guiana), *Schomburgk* 446 (isotype, BM!).

Stem compact, horizontal, to 10 mm in diameter, scales linear-lanceolate, pale, ca. 5 mm long, margins with long, hairlike teeth. **Phyllopodia** distinct. **Leaves** fasciculate, 16–36 cm long, 2.2–3.7 cm broad. **Petiole** $\frac{1}{10}$ – $\frac{1}{4}$ the sterile leaf length, densely clothed with spreading orange scales similar to those of the stem but broader, scales to 5 mm long. **Lamina** narrowly elliptic to narrowly oblanceolate, apex acute to obtuse, base acuminate. **Veins** obscure, free, ca. 1 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** abundant, overlapping, lanceolate, ca. 2–3 mm long, orange, long hair-toothed, completely covering abaxial side of leaf and sporadic to lacking on adaxial side, denser along costa. **Fertile leaves** about equal the sterile in length, petiole about $\frac{1}{2}$ the fertile leaf length, lamina ca. 2 cm broad, lanceolate, scales along abaxial costa, intersporangial scales lacking.

Epiphytic in wet forests, 120–150 m, Loreto.

Guianas; Venezuela; Colombia; Ecuador; Peru; Brazil.

Loreto: Maynas, Río Nanay, Casería Mishana, 30 km SW of Iquitos, *Foster* 4461 (F). Maynas, Dist. Iquitos, Carretera de Varillal, km 6 de Quisto Cocha al caserío de Varillal, *Rimachi* Y. 7845 (NY). Maynas, Iquitos, road beyond Quisto Cocha, *McDaniel* 13593 (GH). Vic. Iquitos, *Revilla* 4317 (UC).

92. *Elaphoglossum poeppigianum* (Fée) Moore, Index fil. 13. 1857.

Acrostichum villosum var. *poeppigianum* Fée, Mém. foug. 2: 50, t. 20, f. 2. 1845. TYPE: Peru, ad Pampayacu, *Poeppig* 190 (holotype, P!; isotype, B, UC!).

Acrostichum poeppigianum (Fée) Fée, Gen. fil. 43. 1852.

Stem compact, horizontal, ca. 3 mm in diameter, scales linear, brown, lustrous, 3–5 mm long, entire. **Phyllopodia** lacking. **Leaves** fasciculate, 28–37 cm long, 11–16 cm broad. **Petiole** $\frac{1}{4}$ ($\frac{1}{10}$) the sterile leaf length, with scales abundant, orange-brown, widely spreading, subulate, slightly toothed, 2–4 mm long. **Lamina** linear-elliptic, chartaceous, apex acuminate, base cuneate to attenuate. **Veins** distinct, free, 2–3 mm apart, at 60-degree angle. **Hydathodes** evident. **Lamina scales** scattered, reddish orange, subulate, slightly toothed, 1–2 mm long on lamina and margin, 2–3 mm long on costa. **Fertile leaves** about equal the sterile in length, petiole $\frac{3}{4}$ the fertile leaf length, lamina elliptic, apex apiculate, base rounded; intersporangial scales lacking.

Endemic. Terrestrial in wet forests, 2085–2700 m, Huánuco, Pasco, Junín.

The van der Werff specimen most closely resembles the type; the Ellenberg collection differs in having an attenuate lamina base and very short petiole.

Huánuco: Carpish, *Ellenberg* 3930 (GH). Carpish, *Sandeman* 5157a (K). **Pasco:** Prov. Oxapampa, San Alberto, Cordillera de Yanachaga, *van der Werff et al.* 8450 (MO, UC). **Junín:** La Merced-Chanchamayo, *Soukup* 1017 (F). **Department unknown:** Toccachillo, *Jelski* 1078 (P).

93. *Elaphoglossum propinquum* (Kuhn) Christ, Monogr. Elaphoglossum. 115. 1899.

Acrostichum propinquum Kuhn, Linnaea 36: 45. 1869. TYPE: Peru, near Agapata, *Lechler* 2007 (holotype, B!; isotype, P!; photos, F & US of P).

Stem compact, to 8 mm in diameter, scales castaneous, stiff to crispate, to 12 mm long. **Phyllopodia** lacking. **Leaves** fasciculate, 15–39 cm long, 2.6–4.5 cm broad. **Petiole** stramineous, $\frac{1}{3}$ – $\frac{1}{2}$ the sterile leaf length, with scales subulate, spreading, sparse to lacking, petiole also with a few minute, erect, glandular trichomes. **Lamina** narrowly lanceolate, chartaceous to subcoriaceous, apex cau-

date, base broadly cuneate to rounded. **Veins** evident, free, 1.5–2 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** black, subulate, mostly along the margin, generally early deciduous, mature specimens with only a few scales or scales totally lacking, lamina also with minute, stellate trichomidia. **Fertile leaves** shorter than the sterile, petiole ca. $\frac{2}{3}$ the leaf length, lamina the same shape as the sterile but slightly narrower; intersporangial scales lacking.

Endemic. Epiphytic or epipetric in wet forests, 1500–3000 m, Amazonas, Huancavelica, Cuzco, Puno.

Amazonas: Bagua, Cordillera Colón near La Peca, *Barbour* 4175 (MO). **Huancavelica:** Tayacaja, Chuspi, *Tovar* 2036 (GH, USM). **Cuzco:** Calahuala, Machu Picchu, *Cook & Gilbert* 881 (US). Torontoy, *Herrera* 1314 (US).

94. *Elaphoglossum pumilio* Mickel, *sp. nov.*

Ab *E. tenuiculo* lamina adaxialiter squamis peltatis, abaxialiter squamis stellatis cum nonnullis ovato-resinoso-sclerotico-ciliatis induta diversa.

Stem short-creeping, ca. 2 mm in diameter, scales linear-lanceolate, lustrous, castaneous to dark brown, 2–3 mm long, entire. **Phyllopodia** distinct. **Leaves** 1–2 mm apart, (5) 11–27 cm long, 0.4–0.6 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{4}{5}$ the sterile leaf length, with castaneous scales ascending to spreading, resinous, 1–2 mm long, with sparse irregular short teeth, the scales mixed with glands and peltate, ciliate, pale scales. **Lamina** linear, chartaceous, apex acuminate to obtuse, base cuneate. **Veins** barely visible, free, ca. 1 mm apart, at 60–70-degree angle. **Hydathodes** lacking. **Lamina scales** abaxially reduced to stellate trichomes with a slight scale body, both surfaces with scattered peltate, round to ovate-lanceolate, red-brown, resinous, ciliate scales; costa abaxially with scattered lanceolate lustrous scales. **Fertile leaves** equal to or slightly longer than the sterile in length, petiole $\frac{3}{8}$ – $\frac{1}{2}$ the fertile leaf length, the lamina narrow, 0.3–0.5 cm broad; intersporangial scales lacking.

TYPE—Peru, Huánuco, Yanano, *Macbride* 4943 (holotype, NY!; isotypes, F!, US!).

Endemic. Terrestrial on roadsides and rocky clay banks, 1850–2800 m, Cajamarca, La Libertad, Huánuco, Cuzco.

This resembles small specimens of *E. tenuiculum* but apparently it lacks strictly stellate tri-

chomes, having round, peltate, ciliate scales that can appear as such.

Cajamarca: Contumazá, alrededores de Guzmango, *Sagástegui 9044* (HUT, MO). Contumazá, Contumazá-Cascas, *Sagástegui et al. 6503* (GH). Contumazá, Bosque de Cachil (Cascas-Contumazá), *López et al. 9063* (GH, US). Prov. Cajamarca, La Posada, (Las Quinuas-Huatum), *Sagástegui 10134* (MO, UC). **La Libertad:** Pataz, *León & Young 1089* in part (USM). **Cuzco:** Hacienda Ayasbamba, *Vargas 365a* (GH).

95. *Elaphoglossum punae* Mickel, *sp. nov.*

Ab *E. tenui* stipitis squamis imbricatis, lamina latoriori, laminaeque squamis ovatis basi-glandulosis segreganda.

Stem long-creeping, ca. 2 mm in diameter, scales linear, lustrous, dark red-brown, ca. 3 mm long, minutely denticulate, recurved. **Phyllopodia** present. **Leaves** 1–2.5 cm apart, 10–32 cm long, 1.1–1.6 cm broad. **Petiole** $\frac{1}{2}$ – $\frac{3}{5}$ the leaf length, scales to 3 mm long at petiole base, distally ca. 1 mm long, longer ones linear-lanceolate and spreading, shorter ones lanceolate, appressed, brown, entire. **Lamina** narrowly elliptic, chartaceous, apex long-acuminate, base cuneate. **Veins** obscure, 1 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** ovate-deltate, to 1.3 mm adaxially; abaxially 0.5–0.8 mm long, scattered, with conspicuous, glandular dots. **Fertile leaves** unknown.

TYPE—Peru, Ayacucho, La Mar, Cordillera Central between Tambo San Miguel, Ayna & Hacienda Luisiana, *Dudley 12031* (holotype, US!; isotype, GH!).

Endemic. Terrestrial in grassland above timberline on exposed summit ridges, 3400–3600 m, Ayacucho.

Similar to *E. tenue* except: petiole scales imbricate, lamina broader (1–1.7 cm) and longer (to 31 cm), abundantly glandular, scales mostly ovate to deltate, ca. 1 mm long, costal and laminar scales often touching, adaxially also glandular, the scales more lanceolate.

Thus far known only from the type collection.

96. *Elaphoglossum quitense* (Baker) C. Chr., Index fil. 314. 1905.

Acrostichum quitense Baker, Ann. Bot. 5: 493. 1891. TYPE: Ecuador, Andes, *Sodirol* (isotype, P!).

Stem compact, horizontal, 3–5 mm in diameter, scales linear, lustrous, orange brown, to 13 mm long, entire. **Phyllopodia** lacking. **Leaves** fasciculate, 11–21 cm long, 0.9–1.4 cm broad. **Petiole** $\frac{1}{2}$ – $\frac{1}{2}$ the sterile leaf length, scales tan, linear, patent, some curved, lax, to 4 mm long, with some minute erect glandular trichomes. **Lamina** linear-elliptical, chartaceous, apex acute to obtuse, apiculate, base narrowly cuneate. **Veins** obscure, free, ca. 1 mm apart, at ca. 60-degree angle. **Hydathodes** distinct. **Lamina scales** abundant, narrow, not overlapping laterally, 1–2 mm long, pale, tan to white, adaxial surface glabrescent or with scales longer than on abaxial surface. **Fertile leaves** barely shorter to somewhat longer than the sterile, petiole $\frac{2}{3}$ – $\frac{3}{4}$ the fertile leaf length, lamina oblong, shorter than but as broad as the sterile, apex acute to obtuse, base rounded; perhaps with a few intersporangial scales.

Epiphytic in wet forests, 2500–3265 m, Cajamarca, La Libertad, San Martín, Huánuco, Junín. Colombia; Ecuador; Peru.

Cajamarca: Celendín, Gelig, *Mostacero et al. 0899* (F, GH). Contumazá, *López et al. 3727* (F, GH, NY). Callanjaya, *Díaz & Vásquez 634* (USM). **La Libertad:** W of Huamachuco, *Correll & E. Smith P938* (GH). **San Martín:** Huallaga, Valley Río Apisoncho, *Hamilton & Holligan 904* (US). **Huánuco:** Cerro de Pasco, *Ellenberg 4012* (GH). Mito, *Bryan 389* (F). **Junín:** Huancayo, *Kunkel 420*, in part (GH).

97. *Elaphoglossum raywaense* (Jenm.) Alston, Bol. Soc. Brot. 2, 32: 24. 1958.

Acrostichum raywaense Jenm., Ferns Brit. W. Ind. 341. 1909. TYPE: Guyana, region of Mt. Raywa, on upper parts of Isorooro River, *Jenman* (holotype, NY!; isotype, NY!).

Acrostichum apodum var. *sprucei* Baker, in Mart., Fl. bras. 1(2): 578. 1870. TYPE: Brazil, Prov. Alto Amazonas, in sylvis catingas prope S. Gabriel da Cachoeira, *Spruce 2186* (not located).

Stem compact, horizontal, 0.3–1 cm in diameter, scales linear-lanceolate, yellow-brown to ferruginous, lustrous and sometimes resinous toward the tip, 5–8 mm long, undulate, entire. **Phyllopodia** present. **Leaves** fasciculate, 18–56 cm long, 2.2–6 cm broad. **Petiole** almost lacking, 0.5–1.0 cm long, covered by dense subulate scales, 6 mm long, golden-orange, densely spreading on petiole and base of costa, 4–6 mm long, also with short, minute, resinous, brown, capitate glandular

trichomes on petiole and both faces of costa. **Lamina** oblanceolate, chartaceous, apex acuminate to long-caudate, base attenuate. **Veins** evident, free, ca. 0.8 mm apart, at 45-degree angle. **Hydathodes** lacking. **Lamina scales** on costa abundant, subulate, orange to orange-brown, mixed with many short, minute, resinous, capitate glandular trichomes, laminar scales brown-orange to yellow-orange, 0.5–1.5 mm long, spreading mostly on the adaxial surface, lamina also densely covered with short, appressed, resinous, capitate glandular trichomes which are usually oriented toward the margin, margin densely covered by 2 or more rows of fine subulate scales, similar in size and color to those on the costa. **Fertile leaves** shorter than the sterile, petiole about equal to that of the sterile leaf, lamina narrower than the sterile, lanceolate to linear-lanceolate, apex acuminate, base attenuate, petiole alate; intersporangial scales lacking.

Epiphytic in wet forests, 275–1200 m, Amazonas, San Martín, Loreto, Huánuco, Pasco, Junín, Ucayali, Madre de Dios.

Guianas; Venezuela; Ecuador; Peru; Brazil.

Amazonas: Bagua, Río Marañón, *Wurdack* 1858 (US), 1989 (F, GH, NY, UC). **San Martín:** Mariscal Cáceres, Dist. Tocache Nuevo, *J. Schunke* V. 13751 (MO, NY). Tingo María, *Allard* 20888 (US). **Loreto:** Balsapuerto, Río Huallaga basin, *Killip & Smith* 28498 (NY, US). Maynas, Alpahuayo, *van der Werff et al.* 10264 (UC). **Huánuco:** between Huánuco and Pampayacu, *Kanehira* 151 (GH, US). **Pasco:** Oxapampa, Palcazú, Río Alto Iscozacín, *Foster & d'Achille* 10076 (F). **Junín:** Oxapampa, Shiringamazu, *D. Smith & Salick* 8346 (UC). Cahuapanas, on Río Pichis, *Killip & Smith* 26782 (US). **Ucayali** (as Loreto): Aguaytía, *J. Schunke* V. 5495 (F, NY). **Madre de Dios:** Manú, Cerro de Pantiacolla, Río Palotoa, *Foster et al.* 10693 (F, GH).

98. *Elaphoglossum rimbachii* (Sodirol) Christ, Monogr. *Elaphoglossum* 126. f. 70. 1899.

Acrostichum rimbachii Sodirol, Crypt. vasc. Quit. 478. 1893. TYPE: Ecuador, Prov. Cuenca, entre Surrucucho y Quinoas, *Rimbach* (not located).

Elaphoglossum pichincha Christ, Monogr. *Elaphoglossum* 68. 1899. SYNTYPES: Ecuador, Pichincha, *Sodirol* (P!); Colombia, Azufral, Anden von Pasto, Columb., *André* 3224 and 3352 (not located).

Stem compact, 4–5 mm in diameter, scales linear-lanceolate, lustrous, dark maroon to black, 4–6 mm long, with stiff hairlike teeth (teeth deciduous with age). **Phyllopodia** lacking. **Leaves** approximate, 25–105 cm long, 1.0–2.2 cm broad.

Petiole $\frac{1}{5}$ – $\frac{1}{3}$ the leaf length, scales dense to scattered, black, ca. 1 mm long, slightly spreading, long hair-toothed. **Lamina** linear-elliptic, chartaceous, apex acuminate to narrowly obtuse, base narrowly cuneate. **Veins** obscure, hidden by scales, ca. 1 mm apart, black, sclerotic, 1–3 mm long. **Fertile leaves** nearly equalling the sterile in length, petiole $\frac{1}{3}$ – $\frac{1}{2}$ the leaf length, lamina slightly narrower than the sterile; intersporangial scales present or lacking.

Epiphytic, less commonly terrestrial, in wet forests, 2200–3500 m, San Martín, Huánuco, Pasco. Ecuador; Peru.

San Martín: Mariscal Cáceres, Chochos, NW corner of Río Abiseo Nat. Park, *Young & León* 4569 (USM), *Young* 2190 (NY), 2241 (USM). **Huánuco:** Muña, *Macbride* 4301 (F, GH, NY, US). Tambo de Vaca, *Bryan* 651 (F, GH), 671 (F). **Pasco:** Oxapampa, 2–4 km N of Mallampampa, *D. Smith & Canne* 5863 (MO).

99. *Elaphoglossum rosenstockii* Rosenst., Repert. Spec. Nov. Regni Veg. 4: 6. 1907. TYPE: Ecuador, Mt. Cubilin, *Rimbach* 8, (holotype, s!; isotype, US!).

Elaphoglossum pseudohirtum Rosenst., Meded. Rijks. Herb. Leiden no. 19: 23. 1913. TYPE: Bolivia, in valle Corani, *Herzog* 2165a (not located).

Stem long-creeping, 2–3 mm in diameter, scales linear-lanceolate, lustrous, dark brown, 2–5 mm long, entire. **Phyllopodia** evident. **Leaves** 1–3 cm apart, 24–35 cm long, 1.2–1.6 cm broad. **Petiole** $\frac{1}{2}$ – $\frac{3}{5}$ the sterile leaf length, with orange scales appressed to ascending, 1.5–3 mm long, erose. **Lamina** narrowly elliptic, chartaceous, apex obtuse, base cuneate. **Veins** obscure, free, 1 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** abaxially dense, imbricate, orange to tinged with reddish, sclerotic, lanceolate to linear-lanceolate, erose-denticulate, 1–1.5 mm long, costal scales 2 mm long, wider than on the surfaces, erose, adaxially scattered (dense at first), ovate to lanceolate, erose, white, membranous. **Fertile leaves** about equal the sterile in length, the petiole $\frac{3}{5}$ the fertile leaf length, the lamina about equal the sterile in size and shape; intersporangial scales bicolourous, lanceolate, denticulate, 1.5 mm long.

Terrestrial in patches on open, mossy, rocky places, 3400–3950 m, Cajamarca, Amazonas, Ancash, Huánuco.

Cajamarca: Contumazá, Pampa de la Sal, *Sagástegui* 10745 (F). **Amazonas:** Calla Calla Pequeña, *Clements* 2023 (NY, USM). **Ancash:** Huari, Huascarán Nat. Park, *D. Smith et al.* 12537 (NY). **Huánuco:** Tambo de Vaca, *Macbride* 4450 (F).

100. *Elaphoglossum rubellum* Mickel, *sp. nov.*

Ab *E. siliquoidi* statura minore et lamina apice acuta vel obtusa dispar.

Stem short-creeping, 2–3 mm in diameter, scales lanceolate, brown, with sparse, irregular teeth, contorted, zigzag, ca. 4 mm long. **Phyllopodia** lacking. **Leaves** fasciculate, to 30 cm long, 2.1–3.2 cm broad. **Petiole** $\frac{1}{5}$ – $\frac{1}{3}$ the leaf length, with scales abundant, reddish to blackish, subulate, mostly 4–8 mm long, widely spreading, often curved, lax, petiole also with erect glandular trichomes (3-celled, gland-tipped, to 0.5 mm long). **Lamina** narrowly elliptic, chartaceous, apex obtuse, base truncate to rounded. **Veins** obscure, free, 1.5–2 mm apart, at 50–60-degree angle. **Hydathodes** evident. **Lamina scales** subulate, reddish, long and conspicuous, mostly 3–5 mm long, lax, uniformly and liberally distributed over the surface, margin and costa, lamina also with erect glandular trichomes as on petiole (3 cells, 0.2–0.5 mm long). **Fertile leaves** much shorter than the sterile, usually about $\frac{1}{2}$ the length, lamina orbicular to elliptic, apex obtuse, base rounded, scales on petiole, adaxial lamina surface, and abaxial costa, but intersporangial scales lacking.

TYPE—Peru, Ucayali (as Loreto), Coronel Portillo, Boquerón del Padre Abad, *J. Skog et al.* 5127 (holotype, NY!; isotype, US!).

Endemic. Epipetric on wet shady calcareous cliffs, 400–470 m, Ucayali.

This closely resembles *E. siliquoides* of Jamaica in the very long, reddish, hairlike scales, short rounded fertile leaves, and relatively long, glandular trichomes, but differs in the smaller size, the acute to rounded lamina apex, and being epipetric rather than epiphytic.

Ucayali: Coronel Portillo, Dist. Padre Abad, *J. Schunke* V. 3064 (F, US).

101. *Elaphoglossum ruficomus* Mickel, *sp. nov.*

Rhizomatis squamis linearibus ramosis purpureis, lamina laxe squamosa et stipite hirta recognita.

Stem compact, horizontal, ca. 10 mm in diameter, scales linear, long-attenuate, lustrous, maroon, 12–20 mm long, entire. **Phyllopodia** indistinct. **Leaves** fasciculate, (30–)52–66 cm long, 2.5–3.6 cm broad. **Petiole** about $\frac{1}{2}$ the sterile leaf length, with orange scales widely spreading, 8–12 mm long, ciliate, others 2–3 mm long, appressed. **Lamina** narrowly elliptic, chartaceous to coriaceous, apex acute, base broadly cuneate to rounded. **Veins** evident, ca. 1 mm apart, at ca. 60-degree angle. **Hydathodes** lacking. **Lamina scales** abaxially 1–3 mm long, orange, lanceolate to ovate, imbricate to scattered, costa scales 3–4 mm long, linear-lanceolate, spreading, adaxially scattered, orange, 1–2 mm long, ciliate, lanceolate. **Fertile leaves** shorter than the sterile, petiole $\frac{1}{2}$ the fertile leaf length, lamina narrower than the sterile (2.0 cm broad); intersporangial scales lacking or present.

TYPE—Peru, Cajamarca, Celendín, Sendamal (Ruta á Celendín), *Sagástegui* 12091 (holotype, NY!).

Endemic. Epiphytic in wet forest or epipetric on brushy slopes, 3050–4200 m, Cajamarca, San Martín, Ancash.

San Martín: Mariscal Cáceres, Puente del Monte, *Young* 1740 (USM). **Ancash:** Yungay, Quebrada Llanganuco, *Perez* 84 (USM). Yungay, Huascarán Nat. Park, *D. Smith et al.* 9174 (NY).

102. *Elaphoglossum rufum* Mickel, *Brittonia* 37: 277. 1985. **TYPE:** Peru, Dept. San Martín, Lamas, along Río Curiyacu, 8 km above San Antonio, *Belshaw* 3601 (holotype, US!; photo, NY!; isotypes, GH!, UC!).

Stem short-creeping, 3–4 mm in diameter, scales linear-lanceolate, ferruginous, 4–6 mm long, entire, tortuous toward tip. **Phyllopodia** lacking. **Leaves** 31–50 cm long, 4.5–7 cm broad. **Petiole** ca. $\frac{1}{5}$ – $\frac{1}{3}$ the sterile leaf length, with scales abundant, spreading, subulate, somewhat denticulate, rufous, 2–3 mm long. **Lamina** lanceolate, chartaceous, generally with a proliferous bud in the retuse apex, otherwise acute to acuminate, base attenuate. **Veins** distinct to indistinct, free, 1 mm apart, at 60–70 degree angle. **Hydathodes** evident. **Lamina scales** sparse to moderately abundant on both sides, spreading, lanceolate to subulate, 2–3 mm long, denticulate, rufous, denser along costa and margin. **Fertile leaves** about same length as sterile, petiole ca. $\frac{5}{8}$ – $\frac{3}{4}$ the fertile leaf length, lam-

ina lanceolate to narrowly lanceolate, apex obtuse, base cuneate; intersporangial scales sparse to absent, lanceolate, entire to denticulate, spreading, denser along costa and margin, 1–2 mm long.

Endemic. Epiphytic in wet forests, 425–2250 m, Cajamarca, San Martín.

Cajamarca: Prov. Cutervo, San Andres, *López & Sagástegui* 5428 (GH).

103. *Elaphoglossum russelliae* Mickel, *sp. nov.*

Ab *E. cardenasii* non nisi lamina integerrima stipiteque breviora diversa.

Named for Ruth Russell, who has been a volunteer in the New York Botanical Garden fern herbarium for 17 years.

Stem short-creeping, ca. 4 mm in diameter, scales flat, ovate-acuminate, 2–3 mm long, appressed, dark brown, sparse. **Phyllopodia** lacking. **Leaves** fasciculate, to 55 cm long, 2.2–3.0 cm broad. **Petiole** about $\frac{1}{3}$ the sterile leaf length, sparsely clothed with tan, ovate scales 1–3 mm long, mostly appressed. **Lamina** linear-elliptic, thin, apex acuminate, base narrowly to broadly cuneate, margin crenulate. **Veins** evident, free, 1–2 mm apart, at 60–70-degree angle. **Hydathodes** evident. **Lamina** scales abaxially on costa tan, lanceolate, ca. 1 mm long, occasional on margin between crenulations, laminar surfaces with minute stellate trichomidia. **Fertile leaves** shorter than sterile, petiole about $\frac{3}{4}$ the fertile leaf length, lamina smooth-margined, lanceolate, apex acuminate, base truncate to subcordate; intersporangial scales lacking.

TYPE—Peru, Cajamarca, Cutervo, Parque Nacional de Cutervo, *Díaz & Osorio* 2587 (holotype, NY!).

Endemic. Epiphytic in dry woods, ca. 2150 m, Cajamarca, Huánuco.

This is probably the precursor of the bizarrely divided *E. cardenasii*, differing only in the dissection and shorter petiole.

Huánuco: Muña, *Bryan* 531 (F), 533 (F).

104. *Elaphoglossum setigerum* (Sodiolo) Diels, *Nat. Pflanzenfam.* 1(4): 333. 1899.

Acrostichum setigerum Sodiolo, *Anales Univ. Quito* 4: 174. 1890. **TYPE:** Ecuador, Cordillera occidental near Nono, *Sodiolo* (holotype, not located).

Stem compact, horizontal, to 6 mm in diameter, scales linear, reddish orange, to 10 mm long, entire. **Phyllopodia** lacking. **Leaves** fasciculate, 18–28 cm long, 1.7–2.4(–3.6) cm broad. **Petiole** $\frac{1}{4}$ – $\frac{2}{5}$ the sterile leaf length, with scales reddish-orange, spreading, subulate, entire, 2–3 mm long. **Lamina** narrowly elliptic, chartaceous, apex acuminate to cuspidate, base rounded. **Veins** distinct, free, 1.5–2.5 mm apart, at 60–70-degree angle. **Hydathodes** evident. **Lamina** scales scattered, reddish-orange, subulate, slightly dentate, denser at margin, spreading, ca. 2 mm long on costa and margin, 1 mm long on surface, fewer scales on the adaxial surface. **Fertile leaves** slightly shorter than the sterile, petiole $\frac{2}{3}$ – $\frac{3}{4}$ the fertile leaf length, lamina lanceolate, apex acute, base truncate to cordate; intersporangial scales lacking.

Epiphytic(?) in wet forests, 3100 m, Amazonas, Ecuador; Peru.

This species closely resembles *E. crinipes* C. Chr. of Mesoamerica and Hispaniola, and may prove to be the same.

Amazonas: Prov. Chachapoyas, Cerros Calla Calla, *Hutchison & Wright* 5797, in part (GH), 5798 (UC).

105. *Elaphoglossum simulans* Mickel, *sp. nov.*

Ab affini *E. eximio* stipite longiori et lamina latiori base truncata diversa.

Stem creeping, ca. 5 mm in diameter, stem scales flat, appressed, ovate-lanceolate, brown, entire, 2–3 mm long. **Phyllopodia** lacking. **Leaves** 5–10 mm apart, 30–40 cm long, 1.5–2.2 cm broad. **Petiole** about $\frac{1}{2}$ the sterile leaf length, with scales scattered, light brown, tightly appressed at petiole base, distally patent, 1–3 mm long, orange-tan, dense, linear-lanceolate, some subulate. **Lamina** linear or pedately divided into three arms, thin-textured, apex acuminate, base broadly cuneate to truncate, margin crenulate. **Veins** evident, 1.5–2 mm apart, at ca. 70-degree angle. **Hydathodes** evident. **Lamina** scales on costa scattered, orange-tan, subulate, 2–3 mm long, spreading; adaxially scales reduced to sparse squamules 0.3–0.5 mm long, abaxially to stellate trichomidia. **Fertile leaves** unknown.

TYPE—Peru, Cuzco, Urubamba, Machu Picchu, *Peyton & Peyton 1316* (holotype, GH!).

Endemic. Terrestrial in wet forests, 2560–2810 m, Cuzco.

This is like *E. eximium* but in *E. simulans* the stem is long-creeping, the petiole longer, the lamina broader and more truncate at base, there are stellate trichomidia on the lamina, costal scales are spreading, the margin is crenulate, and veins are 2–2.5 mm apart.

I have not seen the one specimen of *E. cardenasii* reported from Peru (Gómez, 1972). There should be no question of its determination, it being so distinct in its pedate form, but the discovery of the same form of dissection in *E. simulans* lends some question to the record of *E. cardenasii*.

Cuzco: Urubamba, Machu Picchu, *Peyton & Peyton 1316b* (GH).

106. *Elaphoglossum squamipes* (Hooker) Moore, Index fil. 15. 1857. Figure 25f–g.

Acrostichum squamipes Hooker, Icon. pl. t. 197. 1837. TYPE: Peru. Chachapoyas, *Mathews* (holotype, K!).

Stem long-creeping, ca. 1 mm in diameter, scales ovate to linear-lanceolate, dull orange-tan, entire, 3–6 mm long. **Phyllopodia** lacking. **Leaves** 3–20 mm distant, 5–14 cm long, 1.1–2.2 cm broad. **Petiole** slender, $\frac{1}{2}$ – $\frac{2}{3}$ the sterile leaf length, moderately clothed with ovate, dull orange scales, these 2–3 mm long. **Lamina** ovate to lanceolate, subcoriaceous, apex obtuse, base broadly cuneate to rounded. **Veins** obscure, free, ca. 1 mm apart, at 60–70-degree angle. **Hydathodes** lacking. **Lamina scales** sparse, small, inconspicuous, 1–2 mm long, linear, often coarsely and irregularly dentate, especially toward the scale base, more frequent on the abaxial surface. **Fertile leaves** equal to or slightly longer than the sterile leaves, petiole ca. $\frac{3}{4}$ the fertile leaf length, lamina ovate to lanceolate, smaller than the sterile with a few dark brown to black scales along the abaxial costa and among the sporangia.

Epiphytic and epipetric in wet forests, 2100–3300 m, Amazonas, San Martín, Huánuco, Pasco. Mexico to Panama; Venezuela and Colombia to Bolivia.

Elaphoglossum squamipes represents a distinct

group with long-creeping stems and broad, pale stem and petiole scales. It is very closely related to *Peltapteris*, which justifiably could be placed in *Elaphoglossum*, differing from *E. squamipes* et aff. only in leaf dissection.

Amazonas: Chachapoyas, upper slopes of Puma-urcu ESE of Chachapoyas, *Wurdack 692* (F, NY, UC, US). Chachapoyas, Cerros Calla Calla, 10 km above Leimebamba on road to Balsas, *Hutchison & Bennett 4753* (F, GH, NY, UC). Chachapoyas, Cerros Calla Calla, 45 km above Balsas midway on road to Leimebamba, *Hutchison & Wright 5825* (F, GH, NY, UC, US). San Martín: Mariscal Cáceres, Río Abiseo Nat. Park, above timberline, Puerta del Monte, *Young 1997* (NY). Mariscal Cáceres, Parque Nac. Río Abiseo, valle Pampa de Cuy León & Young 1280 (USM). Huánuco: Mito, *Macbride 3359* (F, US). Muña, *Bryan 526* (F, US), *Macbride 4024* (F, US). Pasco: Oxapampa, Oxapampa-Villa Rica Road, 7 km from road-head, *Smith & Alban 5571* (NY). Oxapampa, San Alberto, *van der Werff 8459* (UC).

107. *Elaphoglossum stenophyllum* (Sodirol) Diels, Nat. Pflanzenfam. 1(4): 333. 1899.

Acrostichum stenophyllum Sodirol, Crypt. vasc. Quit. 468. 1893. TYPE: Ecuador, Sancullán, *Sodirol*, Dec. 1889 (isotype, US!).

Similar to *E. tectum* in its round, white, peltate scales on the adaxial surface and round, ciliate scales on the petiole, but the abaxial surface in *E. stenophyllum* lacks stellate trichomes, having instead glandular dots below and scattered linear-lanceolate scales on the costa.

Terrestrial on shrubby slopes, 2750–3100 m, Amazonas, Huánuco. Ecuador; Peru.

Amazonas: Chachapoyas, Cerros Calla Calla, *Hutchison & Wright 5805* (UC).

108. *Elaphoglossum styriacum* Mickel, Brittonia 39: 326. 1987. TYPE: Venezuela, Bolívar, Chimantá Massif, *Steyermark 75347* (holotype, MO!).

Stem compact, horizontal, ca. 3–4 mm in diameter, scales linear-lanceolate, orange, 2–3 mm long, entire or with occasional processes. **Phyllopodia** present. **Leaves** fasciculate, 19–37 cm long, 2.5–4.9 cm broad. **Petiole** $\frac{1}{10}$ – $\frac{1}{8}$ the sterile leaf length, glabrous. **Lamina** oblanceolate to elliptic, coriaceous, margin distinctly thickened, apex acu-

minate to obtuse, subcuspidate, base narrowly cuneate-decurrent. **Veins** inconspicuous, free, 1 mm apart, at 55–65-degree angle. **Hydathodes** lacking. **Lamina scales** essentially lacking abaxially, lamina often lustrous, with scattered, dark, stellate trichomidia, adaxially glabrous. **Fertile leaves** equal to or slightly shorter than the sterile, petiole $\frac{2}{5}$ – $\frac{1}{2}$ the fertile leaf length, the lamina narrower than the sterile, 13–16 mm broad; intersporangial scales lacking.

Epiphytic and terrestrial in wet forests, 100–770 m, Amazonas, San Martín, Loreto, Pasco.

Venezuela; Peru.

This species is rather variable in its lamina shape: elliptic to oblanceolate, with apex obtuse to acuminate. The abaxial surface is usually lustrous and has scattered to sparse stellate trichomidia. The stem scales persist onto the phyllopodia, and are linear, orange, with irregular processes.

Amazonas: Bagua, along roadside from Chiriaco to Puente Venezuela, 43 km NE of Chiriaco, *Barbour 4464* (MO). **San Martín:** Mariscal Cáceres, Granja Santa Ines, 4 km arriba de Tocache Nuevo, *J. Schunke V.3651* (F, UC). Road between Moyobamba & Chachapoyas, E of Naranjos at Río Naranjos, *Croat 58155* (F). **Loreto:** Mishuayacu, near Iquitos, *Klug 1461* (NY, US). **Pasco:** Oxapampa, Valle del Palcazú, Río Palcazú, cerca de Iscozacín, *León 718* (F).

109. *Elaphoglossum tambillense* (Hooker) Moore, Index fil. 15. 1857.

Acrostichum tambillense Hooker, Icon. pl. t. 656. 1844. TYPE: Ecuador, Tambillo, *Jameson* (holotype, K!; isotypes, B!, P!).

Stem compact, horizontal, to 10 mm in diameter, scales linear-lanceolate, reddish brown, to 7 mm long, entire. **Phyllopodia** lacking. **Leaves** fasciculate, 7–14 cm long, 1.4–2.3 cm broad. **Petiole** $\frac{2}{5}$ – $\frac{3}{5}$ the sterile leaf length, with scales lacking, but with minute gland-tipped trichomes present. **Lamina** ovate-lanceolate, chartaceous, apex cuspidate to acuminate, base truncate to rounded. **Veins** obscure, free, ca. 1 mm apart, at 70–80-degree angle. **Hydathodes** evident. **Lamina scales** lacking but gland-tipped trichomes present, especially at base near costa and near margin, mostly on abaxial surface. **Fertile leaves** shorter than the sterile, petiole $\frac{3}{5}$ the fertile leaf length, lamina similar to sterile in shape but smaller, apex acute; intersporangial scales lacking.

Grassy cliffs, upland gorge, 2000–2800 m, Huánuco, Cuzco.

Ecuador; Peru.

Huánuco: Mito, *Macbride 3373* (F, US). **Cuzco:** Torontoy, *Herrera 1326* (US).

110. *Elaphoglossum tectum* (Willd.) Moore, Index fil. 15. 1857.

Acrostichum tectum Willd., Sp. pl. ed. 4, 5: 102. 1810.

TYPE: Venezuela, Caripe, *Humboldt* (holotype, B!, *Herb. Willd. 19520!*; isotypes, LE!, P!).

Acrostichum elongatum Kunze, Linnaea 9: 31. 1834.

TYPE: Peru, ad Pampayacu, 1829, *Herb. Kunze*. (holotype, LZ, destroyed; isotype, B?)

Elaphoglossum elongatum (Kunze) Moore, Index fil. 9. 1857.

Stem short- to moderately creeping, 2–4 mm in diameter, scales linear-lanceolate, dark reddish-black, sclerotic, lustrous, 3–5 mm long, with tortuous tip, entire, or with sparse pale weak hairlike teeth. **Phyllopodia** indistinct, usually hidden by scales. **Leaves** fasciculate to slightly spaced, to 3 mm apart, 15–44 cm long, 1.4–2.8 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{1}{2}$ the sterile leaf length, with scales appressed, peltate, round with dark center and short hairlike teeth, often mixed with scattered dark scales like those of stem. **Lamina** linear-elliptic, apex long-acuminate, base narrowly cuneate. **Veins** obscure, free, mostly 0.7–1 mm apart, at ca. 80-degree angle. **Hydathodes** lacking. **Lamina scales** on adaxial surface white, appressed, round, peltate, dentate to ciliate, becoming glabrous with age, on abaxial surface reduced to stellate trichomes. **Fertile leaves** about as long as the sterile or slightly longer, petiole usually $\frac{1}{2}$ – $\frac{2}{3}$ the fertile leaf length, lamina narrower than the sterile; intersporangial scales lacking.

Terrestrial on rocks and walls, in woods and fields, 1800–2900 m, Cajamarca and Amazonas south to Ayacucho and Cuzco.

Mexico to Panama; West Indies; Venezuela and Colombia to Bolivia and Brazil.

This species is readily distinguished by the round, peltate scales on the petiole and adaxial lamina surface and stellate trichomes on the abaxial surface.

Cajamarca: Celendín, Gelig, *Mostacero 866* (HUT, MO, UC). **Amazonas:** Chachapoyas, Cano Santa Lucia, *Wurdack 735* (F, GH, NY, UC, US). Cerros Calla Calla, *Hutch-*

ison & Wright 4818A (us). **San Martín:** Tingo María, *Allard 22205* (us). **Huánuco:** Prov. Huánuco, Chinchao, entre Huánuco y Tingo María, *Ferreira 16941* (GH). **Mito,** *Macbride & Featherstone 1391* (us). **Junín:** La Merced Chanchamayo, *Soukup 1099* (F). Prov. Tarma, between Palea & Carpapata, *Stork 10959* (K). Huacapistana, *Killip & Smith 24177, 24319* (us). **Ayacucho:** Carrapa between Huanta & Río Apurímac, *Killip & Smith 22424* (GH). **Cuzco:** Machu Picchu, road to ruins, *León 460* (GH). Machu Picchu to San Miguel, Urubamba, *Vargas 2066* (us).

111. *Elaphoglossum tenue* Mickel, *sp. nov.*

Rhizomate tenuissimo squamis recurvis induto necnon lamina parva gracili infra laxe squamata notabilis.

Stem long creeping, ca. 1–2 mm in diameter, scales linear, lustrous, dark brown, ca. 5 mm long, recurved, with sparse small teeth. **Phyllopodia** evident, ca. 5 mm long. **Leaves** 1–2 cm apart, 8–16 cm long, 0.4–0.6 cm broad. **Petiole** about ½ the sterile leaf length, with orange scales scattered, appressed to spreading, 1 mm long, with small teeth. **Lamina** linear-elliptic, chartaceous, apex acuminate, base narrowly cuneate. **Veins** evident, free, 1 mm apart, at 60–70-degree angle. **Hydathodes** lacking. **Lamina scales** abaxially linear-lanceolate, 2 mm long, orange, cilio-denticulate, often contorted, with glandular base, adaxially scattered, lanceolate, dentate near scale base, mostly on costa. **Fertile leaves** not known.

TYPE—Peru, Cuzco, La Convención, Cordillera Vilcabamba. *Dudley 11192* (holotype, GH).

Endemic. Epiphytic in wet forests, 3330–3410 m, Cuzco.

Thus far known only from the type.

112. *Elaphoglossum tenuiculum* (Fée) Baker, *Ann. Bot. (London)* 5: 491. 1891.

Acrostichum tenuiculum Fée, *Mém. foug.* 10: 6, t. 29, f. 2. 1865. **TYPE:** Venezuela, Tovar, *Fendler 272* (holotype, P!).

Stem short-creeping, ca. 2 mm in diameter, scales linear-lanceolate, lustrous, castaneous to brown, ca. 2 mm long, entire. **Phyllopodia** distinct. **Leaves** 1–2 mm apart, 9–13 (30) cm long, 0.4–2.0 cm broad. **Petiole** ½–½ the sterile leaf length, with sparse stellate trichomes and glandular dots, occasionally with sparse scales near base. **Lamina**

linear, chartaceous, apex acuminate, base cuneate. **Veins** barely visible, free, ca. 1 mm apart, at 60–70-degree angle. **Hydathodes** lacking. **Lamina scales** lacking, stellate trichomes or resinous dots on abaxial surface, those on the adaxial surface with slight scale body. **Fertile leaves** shorter than the sterile, petiole about ½ the fertile leaf length, lamina narrower than the sterile, 5 mm broad; intersporangial scales lacking.

Terrestrial on wet banks and cliffs, 1500–3650 m, Amazonas, La Libertad, Lima, Junín, Cuzco.

Costa Rica; Panama; Venezuela; Colombia to Bolivia and Brazil.

There is considerable variation in the degree of pubescent vs. glandular dots.

Amazonas: Chachapoyas, Quebrada Molina 5 km below Chachapoyas, *Wurdack 653* (F, GH, UC, US). **La Libertad:** 3 km W of Huamachuco, *Correll & Smith P936* (GH). **Lima:** Canta, 4 km up road Huamantanga from Lima-Canta road, *Saunders 1247* (GH). **Junín:** Carpapata, 27 km from Tarma, *Gentry et al. 39772* (F). Carpapata, above Huacapistana, *Killip & Smith 24410* (us). **Cuzco:** Paucartambo, Manú Nat. Park, *Skog & Skog 5197* (us). Paucartambo, Paso del Aguila, Pillawata, *Vargas C. 22996* (GH). Río Marcapato, 60 km above Quincemil, *Madison 1010 pp* (GH). Hacienda Huy-Huy, Valle de “Graves” *Bües 1823* (us).

113. *Elaphoglossum tomentellum* Mickel, *sp. nov.*

Lamina parva gracili squamis multo dissectis aurantiacis induta, necnon costae squamis lineari-lanceolatis ab affinibus diversa.

Stem compact, horizontal, ca. 2 mm in diameter, scales linear, lustrous, castaneous, ca. 5 mm long, subentire, glandular. **Phyllopodia** evident. **Leaves** fasciculate, 9–16 cm long, 0.4–0.7 cm broad. **Petiole** ½ the sterile leaf length, scales orange, appressed to spreading, ca. 2 mm long, subentire or irregularly sparsely dentate. **Lamina** narrowly elliptic, chartaceous, apex acute to acuminate, base narrowly cuneate. **Veins** obscure, 1 mm apart, at ca. 70-degree angle. **Hydathodes** lacking. **Lamina scales** abaxially orange, much reduced to linear or ovate with cilia longer than the scale body, gland-based, costal scales linear, reddish, dentate, ca. 2 mm long; adaxial scales round to lanceolate, white, ciliate at base, ca. 1 mm long, or orange and dense when young, 1–2 mm long. **Fertile leaves** not known.

TYPE—Peru, Cajamarca, Contumazá, Cerro Campanillas, Guzmango, *Sagástegui* 2993 (holotype, GH!).

Rocky slopes, 3050 m, Cajamarca.

Thus far known only from the type.

114. *Elaphoglossum velongum* Mickel, *sp. nov.*

Ab *E. latifolio* lamina lineari et stipitis squamis aurantiacis sparsis abstat.

Stem compact, horizontal, 4–7 mm in diameter, scales linear-lanceolate, lustrous, orange, 7–10 mm long, with hairlike processes. **Phyllopodia** present. **Leaves** fasciculate, 27–30 cm long, 1.8–2.1 cm broad. **Petiole** $\frac{1}{4}$ the sterile leaf length, at base with orange scales as on stem, reduced distally nearly to stellate trichomes, scales appressed to spreading. **Lamina** linear, subcoriaceous, apex acuminate, base narrowly cuneate. **Veins** obscure, free, 1 mm apart, at 70–80-degree angle. **Hydathodes** lacking. **Lamina scales** sparse, orange or white, highly dissected, almost tuft-like (these nearly reduced to stellate trichomes with long lax arms). **Fertile leaves** longer than the sterile, petiole $\frac{1}{2}$ the leaf length, lamina similar to the sterile in size and shape; intersporangial scales lacking.

TYPE—Peru, Amazonas, Leimebamba, *Woytkowski* 7842 (holotype, GH!).

Endemic. Terrestrial in wet forests, 2400–2800 m, Cajamarca, Amazonas.

Cajamarca: Celendín, La Ranca-Gelig, *Sagástegui* 12133 (NY). **Amazonas:** Cordillera de Calla Calla; Balsas-Leimebamba road, *Duncan* 2607 (US). Prov. Chachapoyas, Quebrada Molino, *Wurdack* 655 (US), 656 (US).

115. *Elaphoglossum vittarioides* Mickel, *sp. nov.*

Ab *E. eatoniano* Rhizomatis squamis ciliatis, costae squamis brevioribus, necnon lamina adaxialiter squamulosa recedens.

Stem compact, 2–3 mm in diameter, scales lanceolate-deltate, lustrous, black, very indurated, 2–3 mm long, with lax, tan, marginal trichomes. **Phyllopodia** present but very short (5–8 mm). **Leaves** approximate, 21–35 cm long, 4–6 mm broad. **Petiole** $\frac{1}{10}$ – $\frac{1}{4}$ the sterile leaf length, scales scattered, appressed, black, with white teeth, to 2 mm long at petiole base, distally smaller and with pale scale margin. **Lamina** linear, coriaceous, apex

long-acuminate, base attenuate. **Veins** obscure. **Hydathodes** lacking. **Lamina scales** adaxially scattered, orange-tan, lanceolate, 1–1.5 mm long, subentire to very short-ciliate, some of those on costa with dark center, slightly imbricate to glabrescent, abaxially tightly appressed, orange or white with orange center, deltate, subentire to short-ciliate, to 1 mm long, costal scales linear-lanceolate, black, 1–1.2 mm long, distally with broader white margin, subentire to short-ciliate. **Fertile leaves** unknown.

TYPE—Peru, Cuzco, Paucartambo, Sta. Isabel, *Vargas* 1306 (holotype, UC!).

Endemic. Epiphytic in wet forests, 1150 m, Cuzco.

This forms a complex with *E. eatonianum* and *E. chloödes*, which see for further discussion.

Thus far known only from the type.

116. *Elaphoglossum vulcanicum* Christ, Monogr. Elaphoglossum 131. 1899.

Acrostichum furfuraceum Baker, J. Bot. 15: 166. 1877. not Kuhn, 1869.

TYPE: Ecuador, Andes of Quito, *Sodiño* (holotype, K).

Stem widely creeping, ca. 2–3 mm in diameter, scales linear, lustrous, dark red-brown, 2–6 mm long, entire to sparsely denticulate. **Phyllopodia** distinct, ca. 2 cm long. **Leaves** ca. 1 cm apart, 10–27 cm long, 1.5–2.6 cm broad. **Petiole** $\frac{1}{3}$ – $\frac{1}{2}$ the sterile leaf length, scales black, sclerotic, appressed to spreading, ovate to lanceolate, 1–3 mm long, dentate. **Lamina** narrowly oblong, subcoriaceous, apex obtuse, base cuneate. **Veins** evident, free, 1 mm apart, at 60–70-degree angle. **Hydathodes** lacking. **Lamina scales** of costa black, ciliate, 1 mm long, deltate to lanceolate, scales on adaxial and abaxial surfaces scattered, orange (abaxially) or white (adaxially), margin with concentrated scales often black or flecked with black. **Fertile leaves** longer than the sterile, petiole $\frac{3}{4}$ the fertile leaf length, lamina linear, 3–6 mm broad, inrolled; intersporangial scales lacking.

Epiphytic in wet forests, 2450–3600 m, San Martín, Huánuco, Cuzco.

Ecuador; Peru; Bolivia.

Peyton & Peyton 945 has petiole scales more spreading than usual.

San Martín: Mariscal Cáceres, forest patch isolated above timberline, Chochos NW corner of Río Abiseo Nat. Park, *Young & León 4651* (USM). **Huánuco:** Muña, trail to Tambo de Vaca, *Macbride 4304* (F). Cushi, trail to Tambo de Vaca, *Bryan 623* (F). **Cuzco:** La Convención, Huayopata, 8 km from Incatambo, *Peyton & Peyton 945* (GH). Paucartambo, cordillera de 3 cruces, *Vargas C. 12241* (GH). Río Calzada, Huadquina, *Bües 1266* (US).

117. **Elaphoglossum wardiae** Mickel, *Brittonia* 37: 277. 1985. TYPE: Bolivia, Dpto. Cochabamba, Prov. de Chapare, road to San Onofre, *M. S. Foster 79-179* (holotype, UC!).

Stem short-creeping, 4 mm in diameter, scales dark brown, lustrous, narrowly deltate, crispate, irregularly serrate, 2–3 mm long. **Phyllopodia** lacking. **Leaves** to 1 cm apart, 31–36 cm long, 4.0–5.7 cm broad. **Petiole** $\frac{1}{4}$ – $\frac{1}{3}$ the sterile leaf length, with scales abundant, appressed to spreading, lanceolate, peltate, tan, 2–3 mm long, minutely serrulate. **Lamina** lanceolate, chartaceous, apex notched with bud, base broadly cuneate. **Veins** distinct, free, 2–3 mm apart, at ca. 70-degree angle. **Hydathodes** evident. **Lamina scales** absent to sparse on both sides, peltate, deltate to lanceolate, somewhat appressed, tan, 1–2 mm long, minutely serrulate, sometimes more dense along margin. **Fertile leaves** nearly equal to the sterile in length, petiole $\frac{3}{4}$ – $\frac{4}{5}$ the fertile leaf length, lamina lanceolate, apex apiculate, base broadly cuneate; intersporangial scales abundant, peltate, ovate to lanceolate, finely serrulate, tan, 1–2 mm long, somewhat appressed on costa.

Epiphytic in wet forest, 700–1700 m, Huánuco, Madre de Dios.
Peru; Bolivia.

Huánuco: La Divisoria, NE of Tingo María on road to Pucallpa, *Moran 3703, 3705* (MO). **Madre de Dios:** Prov. Manú, Cerro de Pantiacolla, *Foster et al. 10890* (GH).

118. **Elaphoglossum williamsiorum**, Mickel, *sp. nov.*

Rhizomate longe repenti et frondibus elongatis trichomidiis stellatis minutis sparsis (minutim stellato-punctatis) notanda.

Named for Ethelyn and Victor Williams, who have long been supporters of the New York Bo-

tanical Garden fern program. Ethelyn has been the primary fern propagator, by spores, for the Garden for the past 16 years.

Stem long-creeping, 4–6 mm in diameter, scales lanceolate, lustrous, brown to black, ca. 3 mm long, entire. **Phyllopodia** present. **Leaves** ca. 3 cm apart, 75 cm long, 5.0–5.7 cm broad. **Petiole** $\frac{2}{3}$ the sterile leaf length, glabrous. **Lamina** narrowly elliptic, chartaceous, apex lacking, base attenuate. **Veins** obscure, free, 1 mm apart, at 70–80-degree angle. **Hydathodes** lacking. **Lamina scales** lacking adaxially, lamina abaxially with black stellate-punctate indument. **Fertile leaves** not seen.

TYPE—Peru, Cuzco, Urubamba, Machu Picchu, 0.5 km N of union of Sayacmarca & Aobamba Rivers, *Peyton & Peyton 1491* (GH).

Endemic. Terrestrial in wet forests, 2390 m, Amazonas, Cuzco.

This superficially resembles *E. amplum*, which see.

Amazonas: Bongará, above Pedro Ruíz on road to Pomacochas, *Knapp & Alcorn 7550* (UC). Prov. Chachapoyas, slopes of Puma-arcu SE of Chachapoyas, *Wurdack 554* (US).

119. **Elaphoglossum zebrinum** Mickel, *sp. nov.*

Ab *E. oblanceolato* statura minori laminisque angustis diversa.

Stem short-creeping, 2–4 mm in diameter, scales mostly lacking, some small ones 1–2 mm long near apex, black, lustrous, linear-lanceolate, entire. **Phyllopodia** lacking. **Leaves** fasciculate, 32–47 cm long, 2.3–3.4 cm broad. **Petiole** nearly lacking, to $\frac{1}{10}$ the sterile leaf length, glabrous but with white blotches on petiole and lamina (mostly between the veins). **Lamina** linear-oblanceolate, chartaceous, costa strongly keeled, apex acuminate, base long-attenuate. **Veins** obscure, free, 1.5–2 mm apart, at ca. 70-degree angle. **Hydathodes** distinct. **Lamina scales** sparse on both surfaces, subulate, brown, generally less than 1 mm long. **Fertile leaves** slightly shorter than the sterile, petiole about $\frac{1}{2}$ the fertile leaf length; intersporangial scales lacking.

TYPE—Peru, Amazonas, Bagua, Valley Río Mañón, *Wurdack 1859* (holotype, US!).

Epiphytic in wet forests, 295–1000 m, Lamba-yeque, Amazonas, Madre de Dios.

Colombia; Peru.

Lambayeque: Puerto Nazareth, near Olmos, *Ellenberg* 3427 (GH). **Madre de Dios:** Manú, Cerro de Pantiacolla, Río Palotoa, NNW of Shintuya, *R. Foster* 10639 (F), 10891 (GH).

Comments

At the time the manuscript was being delivered to the printer, two more new species were discovered. Although it was impractical at this point to revise the key and order of species, they are included here as addenda.

Elaphoglossum pattersoniae Mickel, Amer. Fern J. 80: 110. 1990. TYPE: Peru, Pasco, Prov. Oxapampa, Oxapampa-Villa Rica road, *D. Smith & Alban* 5590 (holotype, NY!; isotype, MO!).

Stem compact, horizontal with ascending apex, scales linear, lustrous, dark red-brown, ca. 4 mm long, denticulate, ascending. **Phyllopodia** present. **Leaves** fasciculate, 6–16 cm long, 1.2–1.8 cm broad. **Petiole** $\frac{1}{2}$ the sterile leaf length, scales 1–2 mm long, linear-lanceolate, ascending to spreading, dark red-brown, lustrous, cilio-denticulate. **Lamina** elliptic, chartaceous, apex obtuse to broadly acute, base cuneate. **Veins** at 55–60-degree angle. **Hydathodes** lacking. **Lamina** surface adaxially with scattered orange-tan, stellate to lanceolate cilio-denticulate scales, to 0.5 mm long, costal scales more abundant and lustrous red-brown, those on abaxial surface more sparse, smaller, and costal scales mostly orange-tan. **Fertile leaves** longer than the sterile, petiole $\frac{2}{3}$ the leaf length, similar to sterile but narrower, ca. 8 mm broad; scales of petiole and adaxial lamina surface mostly sub-stellate, lustrous, dark red-brown, appressed; intersporangial scales lacking.

Terrestrial in high montane rain forest, 2120 m. *Elaphoglossum pattersoniae* is closest in Peru to *E. guamanianum*, but differs from that in its smaller size, acute-obtuse lamina apex, lack of dark-arachnoid scales on the costa abaxially, and fewer laminar scales.

Known only from the type.

Elaphoglossum potomogeton Mickel, Amer. Fern J. 80: 112. 1990. TYPE: Peru, Junín, Prov. Chanchamayo, Chilpez, ca. 26 km S of San

Ramón, *D. Smith & Palacios* 2653 (holotype, NY!; isotype, MO).

Stem long-creeping, 1–1.5 mm in diameter, scales linear, lustrous, dark red-brown, ca. 3 mm long, entire, slightly recurved. **Phyllopodia** present, covered by scales. **Leaves** 0.5–1.5 cm apart, 13–17 cm long, 1.7–2.2 cm broad. **Petiole** $\frac{2}{5}$ – $\frac{1}{2}$ the sterile leaf length, scales 2–3 mm long, linear-lanceolate, spreading and recurved to appressed distally on the petiole, tan to sclerotic, red-brown, entire. **Lamina** elliptic, chartaceous, apex obtuse, base broadly cuneate. **Veins** obscure, ca. 1 mm apart, at 65-degree angle. **Hydathodes** lacking. **Lamina scales** ovate to ovate-deltate, fimbriate-denticulate, ca. 0.5 mm long, sparse abaxially, abaxially and adaxially concentrated at the margin, to 1 mm long, lamina surfaces with scattered glandular dots. **Fertile leaves** longer than the sterile, petiole ca. $\frac{1}{3}$ the frond length, similar to the sterile in apex and base but narrower, ca. 1 cm broad; intersporangial scales lacking.

Epiphytic, primary high montane forest dominated by *Podocarpus*, *Cedrela*, and *Juglans neotropica*, 1720–1850 m.

Elaphoglossum potomogeton resembles *E. punae* and *E. longius* in the slender, long-creeping stem with red-brown recurved scales and the lamina surface with glandular dots. It is distinct from those species in its obtuse lamina apex and laminar scales concentrated at the lamina margin.

Known only from the type.

The following names, based on Peru material collected by Poeppig, undoubtedly pertain to species of *Elaphoglossum*. However, they cannot be placed without reference to the original specimens, which have not been located.

Acrostichum adenolepis Kunze, Linnaea 9: 27. 1834. TYPE: Peru, Pampayacu, *Poeppig*, Jul. 1829 (holotype, not located).

Acrostichum calophyllum Kunze, Linnaea 9: 27. 1834. TYPE: Peru, Pampayacu, *Poeppig* (holotype, not located).

Acrostichum curvans Kunze, Linnaea 9: 30. 1834. TYPE: Peru, Pampayacu, *Poeppig diar.* 1115, Jul. 1829 (holotype, not located).

Acrostichum dissimile Kunze, Linnaea 9: 28. 1834. TYPE: Peru, Cassapi, *Poeppig*, Jul. 1829 (holotype, not located).

XXVI. *Peltapteris*

Contributed by John T. Mickel.

Peltapteris Link, Fil. spec. 147. 1841. TYPE: *Acrostichum peltatum* (Sw.) Sw. = *Peltapteris peltata* (Sw.) Morton. **Figure 26.**

Rhipidopteris Fée, Mém. foug. 2: 14. 1845, *nom. illeg.*

Epiphytic. **Stem** long-creeping, slender, scaly. **Leaves** small, dimorphic. **Petiole** scaly. **Lamina** flabellate to pinnate, undivided to 4 times divided; if divided, segments linear, glabrous, chartaceous. **Fertile lamina** round, cordate or two-lobed, sporangia covering abaxial surface; spores bilateral.

Five species in tropical America, one widespread, others limited.

We are of two minds regarding the recognition of *Peltapteris* as a genus distinct from *Elaphoglossum*. On the one hand, its leaf architecture is strongly dissected and is easily recognized but tends to be lost in the large number of species in *Elaphoglossum*.

Key to Species of *Peltapteris*

- a. Sterile lamina flabellate, either entire or dissected; fertile lamina orbicular to notched at apex 2. *P. peltata*
- a. Sterile lamina pinnately divided, the pinnae linear, entire or dichotomously divided; fertile lamina linear
 - b. Pinnae with 1 vein per segment, ca. 1 mm broad 1. *P. moorei*
 - b. Pinnae often with more than 1 vein per segment, 2–3.1 mm broad 3. *P. peruviana*

1. ***Peltapteris moorei*** (E. G. Britt.) Gómez, Brenesia 6: 29. 1975.

Acrostichum moorei E. G. Britt., Mem. Torrey Bot. Club 4: 273. 1895. TYPE: Bolivia, Yungas, *Bang* 558 (holotype, NY!; isotype, US!).
Elaphoglossum moorei (E. G. Britt.) Christ, Bull. Herb. Boissier 2, 3: 148. 1903.
Elaphoglossum bangii Christ, Monogr. Elaphoglossum 99. 1899. TYPE: Bolivia, Yungas, *Bang* 558 (holotype, presumably ♀).
Microstaphyla bangii (Christ) Hieron., Bot. Jahrb. Syst. 34: 539. 1904.
Rhipidopteris rusbyi Christ, Farnkr. der Erde 46. 1897. TYPE: Bolivia, Yungas, *Bang* 558 (holotype, presumably ♀).

phoglossum. On the other hand, its anatomy, indument, chemistry, and spores are nearly identical to those of *E. squamipes*, and it is clear that leaf architecture is the only character separating the two taxa.

References

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MICKEL, J. T. 1980. Relationships of the dissected elaphoglossoid ferns. Brittonia, 32: 109–117.
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MORTON, C. V. 1955. Notes on *Elaphoglossum*. III. The publication of *Elaphoglossum* and *Rhipidopteris*. Amer. Fern J., 45: 11–14.
UNDERWOOD, L. M. 1905. A much-named fern. Torreya, 5: 88.

Microstaphyla moorei (E. G. Britt.) Underw., Torreya 5: 88. 1905.

Stem long-creeping, ca. 1 mm in diameter, scaly, lanceolate, orange-tan, 1–2 mm long, entire. **Phylloids** lacking. **Leaves** 3–10 mm apart, 6–14 cm long, 1.5–2.9 cm broad. **Petiole** 1/5–1/2 the leaf length, scales orange-tan, ascending, ca. 1 mm long, entire. **Lamina** narrowly lanceolate, chartaceous, apiculate, acuminate, base truncate, pinnate, the pinnae entire (linear) to furcate, segments 1–1.5 mm broad. **Veins** obscure, free, 1 per segment. **Hydathodes** lacking. **Lamina scales** scattered, orange-tan, linear-lanceolate-deltate, more commonly abaxial.

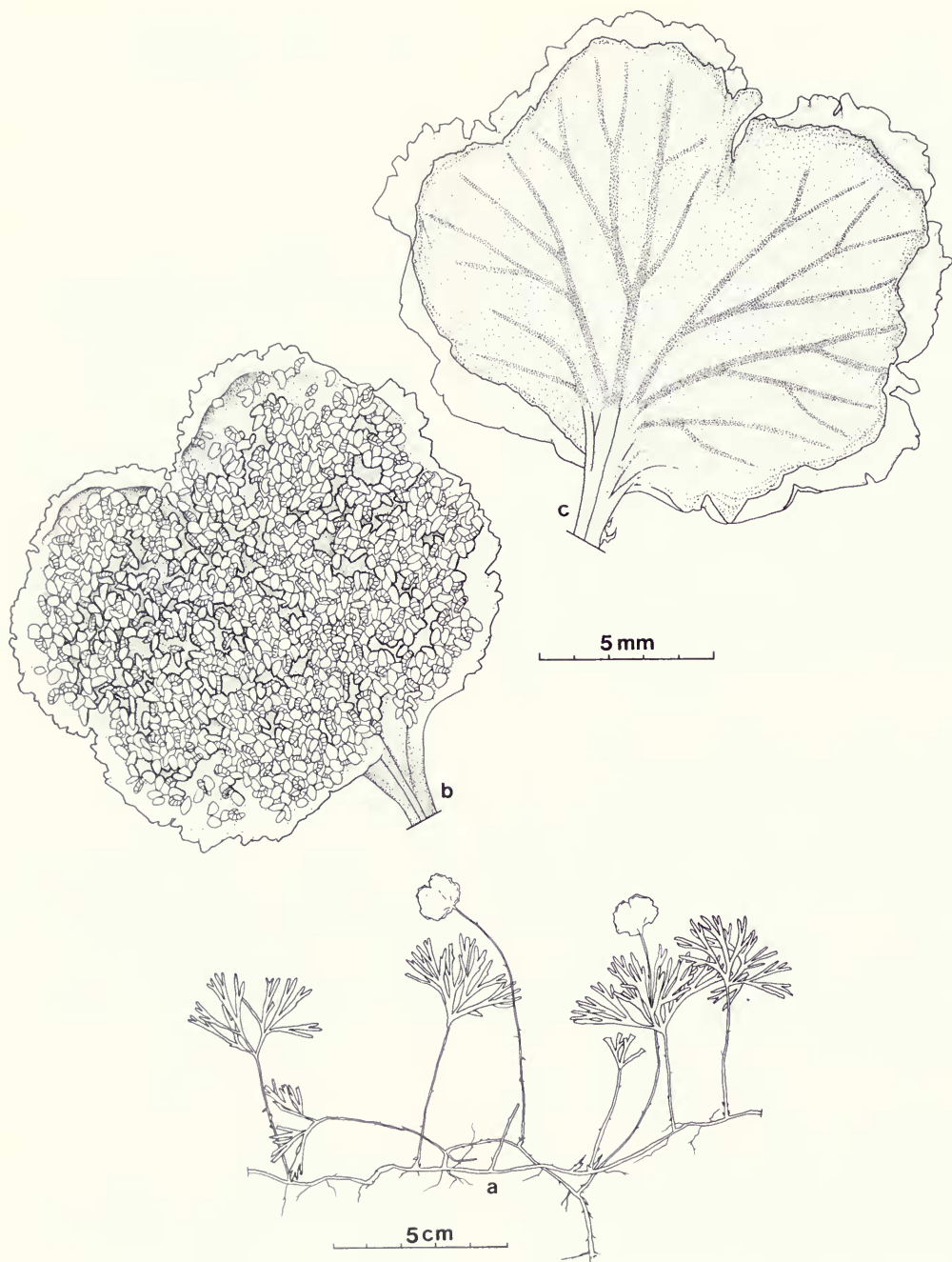


FIG. 26. *Peltapteris peltata* f. *peltata*: a, habit; b, fertile lamina, abaxial side; c, fertile lamina, adaxial side. (From Stolze, Ferns & fern allies of Guatemala, 1981.)

Fertile leaves shorter than the sterile, petiole $\frac{5}{6}$ the leaf length, lamina linear, entire; intersporangial scales lacking.

Epiphytic in wet forests, 1750–2400 m, Cuzco.

Cuzco: Cerro Chuyapi, *Bües 441* (NY). La Convención, alrededores de Tinguimayo (Itma), *Vargas C. 10669* (GH). La Convención, Cordillera Vilcabamba, Knox's Cascade, *Dudley 10490* (GH).

2. *Peltapteris peltata* (Sw.) Morton, Amer. Fern J. 45: 13. 1955.

Osmunda peltata Sw., Prodr. 127. 1788. TYPE: Jamaica, Swartz (holotype, s).

Key to Forms

- a. Sterile lamina 4–5 times dichotomously divided 2a. f. *peltata*
a. Sterile lamina entire or dichotomously divided into two parts 2b. f. *flabellata*

2a. *Peltapteris peltata* f. *peltata*. Figure 26.

Sterile lamina mostly 4–5 times dichotomously divided, the segments linear, 0.5–1.5 mm broad.

Epiphytic in wet forests, 400–1400 m, Amazonas, San Martín, Pasco, Junín, Ucayali.

Mexico to Panama; West Indies; Guianas; Venezuela and Colombia to Peru.

Amazonas: Bagua, Montenegro-Chiriaco, *Sagástegui 5932* (GH). Huampami & Shaim, *Berlin 445* (US). San Martín: Boquerón Pass, 92 km from Tingo María on highway to Pucallpa, *Allard 22122* (GH, US). Pasco (as Junín): Pichis Trail, San Nicolás, *Killip & Smith 26016* (GH, NY). Junín: Schunke Hacienda, above San Ramón, *C. Schunke A149* (US). Hacienda Schunke, La Merced, *Macbride 5809* (US). Chanchamayo Valley, *C. Schunke 460* (US). Ucayali: Coronel Portillo (as Loreto), Padre Abad, Boquerón de Padre Abad, *J. Schunke V. 3047* (GH, NY, US). Coronel Portillo, Km 209 entre Tingo María y Pucallpa, Aguaytia, *Ridoutt*, 31 July 1943 (GH). Coronel Portillo (as Huánuco), Fundo Chela, Sinchono, *Aguilar 918* (USM).

2b. *Peltapteris peltata* f. *flabellata* (Willd.) Gómez, Brenesia 6: 28. 1975.

Acrostichum flabellatum Willd., Sp. pl. 5: 110. 1810. TYPE: America meridionali, *Humboldt & Bonpland* (holotype, b!), *Herb. Willd. 19530*.

Acrostichum peltatum (Sw.) Sw., J. Bot. (Schrad.) 180 (2): 11. 1802.

Rhipidopteris peltata (Sw.) Fée, Mém. foug. 2: 78. 1845.

Elaphoglossum peltatum (Sw.) Urban, Symb. antil. 4: 60. 1903.

Stem long-creeping, slender, ca. 1 mm in diameter, scales lanceolate, tan. **Leaves** dimorphic: sterile ones 3–15 cm long, distant. **Petiole** about $\frac{3}{4}$ the sterile leaf length, sparsely scaly. **Lamina** flabellate, 2.5–5 cm broad, undivided to 5 times dichotomously divided, surfaces with a few small tan scales. **Fertile leaves** longer than the sterile and nearly undivided, usually 2-lobed, 5–20 mm broad.

Acrostichum flabellatum var. *sphenophyllum* Kunze, Linnæa 9: 32. 1834. TYPE: Peru, Poeppig (holotype, LZ, destroyed; isotype, PR; frag., NY!).

Acrostichum sphenophyllum (Kunze) Kunze, Anal. pteridogr. 11, t. 7. 1837.

Rhipidopteris flabellata (Willd.) Fée, Mém. foug., 2: 78. 1845.

Rhipidopteris sphenophylla (Kunze) Fée, Mém. foug., 2: 79. 1845.

Elaphoglossum peltatum f. *flabellatum* (Willd.) Mickel, Brittonia 32: 116. 1980.

Similar to f. *peltata* except in f. *flabellata* the sterile lamina is less divided, either entire or into two lobes.

Epiphytic in wet forests, 700–2200 m, Amazonas to Cuzco and Madre de Dios.

Costa Rica; Panama; Venezuela and Colombia to Peru.

Amazonas: Mendoza, *Woytkowski 8297* (GH). San Martín: In monte Campana prope Tarapoto, *Spruce 463* (NY, US). Pasco: Oxapampa, Cordillera San Matías, *León 323* (USM). Prov. Oxapampa, Abra los Mellizos, *Skogerboe 5039* (US). Junín: Villa Amoretti, near La Merced, *Kunkel 632* (GH). Pichis trail, Porvenir, *Killip & Smith 25903* (US). Ayacucho: Ayna, between Huanta & Río Apurímac, *Killip & Smith 22781* (NY, US). Ccarrapa, between Huanta & Río Apurímac, *Killip & Smith 2320* (GH, NY, US). Cuzco: Paucartambo, Pillawata, Yanamayo-Tombomayo, *Vargas C. 16733* (GH). Prov. Paucartambo, San Pedro a San Isabel, *Vargas C. 6786* (US).

Río Caracol, Valle de San Miguel, La Convención, *Bües 2016* (us). **Madre de Dios:** Manú, Cerro de Pantiacolla, Río Palotoa, 10–15 km NNW of Shintuya, *Foster 10894* (GH).

3. ***Peltapteris peruviana*** Gómez, Rev. Biol. Trop. 18: 217. 1971. TYPE: Peru, Cuzco, Alturas de Sicre, *Bües 1572* (holotype, us!; isotype, CUZ).

This closely resembles *P. moorei* in general architecture, but has the pinnae notched and forked, often with more than one vein per segment.

Endemic. Epiphytic in wet forests, ca. 3050 m, Cuzco.

Thus far known only from the type.



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